

UNITED STATES AIR FORCE IERA

C-5 Confined Space Technical Guidance Document

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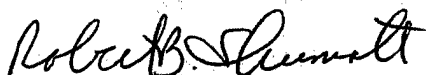
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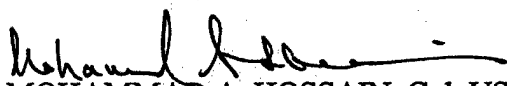
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C-5 GALAXY

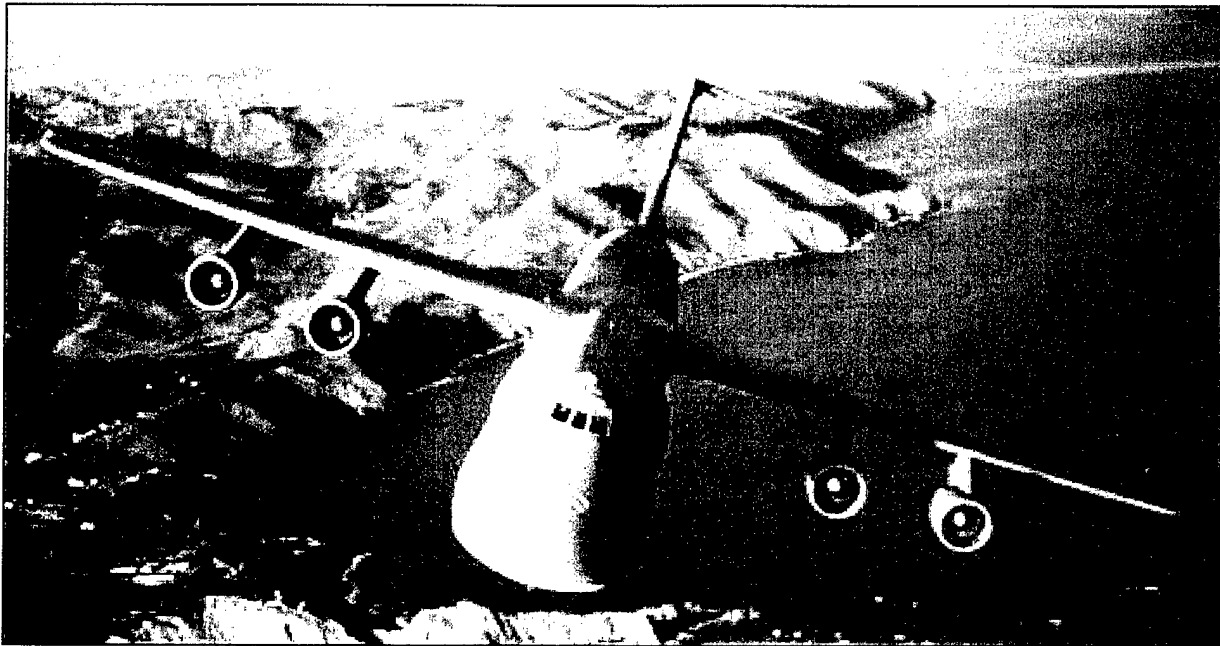


Figure 1. C-5 Galaxy

INTRODUCTION

The Confined Space Technical Guidance Document is not a standardized compliance document. For specific compliance procedures, refer to AFOSH Standard 91-25, *Confined Spaces*; OSHA Standard 29 CFR 1910.146, *Permit-Required Confined Spaces*; and all other applicable AFOSH Standards, Technical Orders (TOs), and Operating Instructions (OIs). The following information and instructions apply to permit-required and nonpermit-required confined spaces associated with the C-5 aircraft.

The majority of activities conducted within these spaces are for inspections and routine scheduled maintenance only. Flightline, depot, and other related activities are not referenced in this document. The information presented for each space type is based on the dimensions, inner characteristics, and interviews with shop personnel. Personnel performing aircraft maintenance and support are extensively trained in safe work practices, and work is conducted in accordance with (IAW) strict TO and OI directives. The TOs and OIs govern procedures such as lockout/tagout and system checks prior to entering the various areas of an aircraft. The following table, *C-5 Space Classification*, lists the classification of each space assessed on the C-5.

TABLE 1. C-5 Space Classification

C-5 Space Classification		
Space Type	Classification	Page Number
Integral Fuel Tanks [Left/Right]:		5
• Main - #1/#4	CP	10
• Main - #2/#3		11
• Auxiliary - #1/#4		13
• Auxiliary - #2/#3		15
• Extended Range - #1/#4		16
• Extended Range - #2/#3		17
Dry Bays [Left/Right]:		
• Wing	CP	18
• Center Wing Root (Forward/Aft)		23
Right/Left Fuel Manifold Area	CP	28
Wing Root Areas - [Left/Right]:		
• Lower	CP	33
• Upper		
Center Wing Box	CP	38
Under-Floor (Underbelly) Area:		
• Forward	CP	43
• Aft		
Forward SPR Pod/Access - [Left/Right]	CP	49
Aft Main Landing Gear Pod - [Left/Right]	CS	54
Forward Pylon Area (Leading Edge) - [Left/Right]:		
• Inboard	CP	57
• Outboard		
Aft Pylon Area (Fire Bottle) - [Left/Right]:		
• Inboard	CS	63
• Outboard		
Wing Leading Edge - [Left/Right]:		
• Inboard	CP	66
• Outboard		
SAR Leading Edge Panel - [Left/Right]:		
• Inboard	NC	72
• Outboard		
Flap Wells	NC	75
Flap Pack Compartment:		
• C-5 A-Model	CS	78
• C-5 B-Model	NC	
Aft Wheel Well Area - [Left/Right]	NC	81
Horizontal Stabilizer:		
• C-5 A-Model	CS	84
• C-5 B-Model		
Horizontal Stabilizer Box Access	CS	87
Vertical Stabilizer (T-Tail)	CS	89
Hayloft area	CS	92
Visor Area	NC	95

C-5 Space Classification		
Space Type	Classification	Page Number
Radome Plug	CS	98
NOTE: CS = Confined Space, CP = Permit-Required Confined Space, NC = Not a Confined Space. ¹ The entire wheel well area is classified as one space type. This space may be listed as two separate spaces (the wheel well area and the crosshead area above the wheel well).		

CLASSIFICATION CRITERIA

A space is classified as a "confined space" when it meets the criteria established by AFOSH Standard 91-25, *Confined Spaces*, and OSHA Standard 29 CFR 1910.146, *Permit-Required Confined Spaces*. ALL of the following criteria must be met in order to classify a space as a confined space:

- the space is large enough to bodily enter and perform work, and
- the space has a limited means of entry and egress, and
- the space is not designed for continuous employee occupancy.

For each confined space, only one of the following criteria must be met in order to classify a confined space as permit-required:

- contains or has the potential to contain a hazardous atmosphere, or
- contains a material that has the potential for engulfing the entrant, or
- has an internal configuration such that an entrant could be trapped or asphyxiated, or
- contains any other recognized serious safety or health hazards.

RECOMMENDED ATMOSPHERIC MONITORING

It is considered a good working practice to test the atmosphere in all confined spaces, both "permit required" and "non-permit required", prior to entry. The person designated to conduct atmospheric tests of confined spaces must be trained in operation, calibration, and maintenance of the testing equipment to include field calibration prior to each use. This may involve zero calibrating the instrument in clean air and using span gases for point calibrations. The atmospheric testing equipment must have a current calibration performed by the Test Measurement Diagnostic Equipment (TDME) lab or the manufacturer. The following atmospheric air monitoring must be conducted prior to permit-required confined space entries:

- **Oxygen (O₂):** The concentration of oxygen in the confined space must be greater than or equal to 19.5 percent and less than or equal to 23.5 percent.
- **Flammability:** The concentration of flammable or combustible vapors, gas, or mist in the confined space must be less than or equal to 10 percent of the Lower Explosive Limit (LEL).
- **Toxic Materials:** Atmospheric concentration of any chemical substance must be below that level which may cause death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to its health effects.

During normal operations, entries must not be conducted when immediately dangerous to life and health (IDLH) conditions exist. Exceptions to this rule are found in AFOSH Standard 91-25, *Confined Spaces*, paragraph 4.3.

C-5 GALAXY

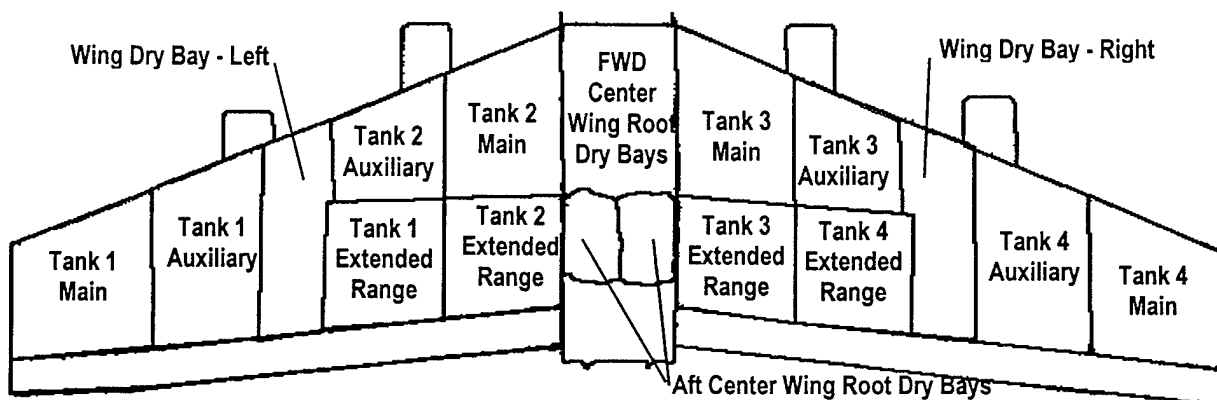
INTEGRAL FUEL TANKS – GENERAL CONDITIONS AND REQUIRED PROCEDURES

SPACE DESCRIPTION

The C-5 aircraft contains a total of 12 (6 on each wing) integral fuel tanks. Integral fuel tanks were developed because they offer the capacity of greater fuel containment with a decrease in weight over a fuel cell type construction. The fuel tanks are designed with seal planes instead of fuel bladders (like the fuel cells) for retaining the fuel. Seal planes provide airtight dividers between the dry bays and surrounding sides of the fuel tanks. They are sealed with gaskets, structural adhesives, elastic films or other sealants. Integral fuel tanks are divided into three types (main, auxiliary, and extended range). The main integral fuel tanks feed fuel to the engines; and the auxiliary and extended range integral fuel tanks store and transfer fuel to the main tanks. The C-5 fuel tanks contain fuel lines charged with nitrogen, fuel level control valves, fuel check valves, fuel drain pumps, fuel quantity probes with wiring, and fuel scavenge ejectors/pumps. The fuel tanks/lines are vented with nitrogen (inert gas) in order to pressurize the fuel system to fill the empty headspaces. The fuel tanks and fuel components contain fuel, nitrogen, or both at all times. Hydraulic lines are located within the fuel tanks in order to prevent them from becoming excessively hot.

Confined space entries into the integral fuel tanks are performed IAW TO 1-1-3, *Inspection and Repair of Aircraft Integral Tanks and Fuel Cells*, 30 November 1994. The TO includes the following information regarding fuel tanks:

- Entering fuel tanks that have been depuddled, purged, docked, and grounded.
- Identifies specific repair/rework procedures, equipment, and chemicals which are authorized for use during entries into integral fuel tanks.
- Outlines specific safety procedures such as ventilation, personal protective equipment, emergency equipment, etc.



TASKS PERFORMED WITHIN THE SPACE

Personnel from several work centers can enter the fuel tanks to perform both general and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, Isochronal (ISO) Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some of the tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following lists scheduled routine maintenance conducted predominantly by the Fuel Systems shop:

- Each week three seam structural leaks are performed. The entire process takes 24 hours. However, the entry duration is approximately 4 hours. After the aircraft has been safely purged, the tank is entered to visually locate the leak(s) from the panel edges. The defective sealant is removed before the new sealant is installed. Each seam leak requires 1 pint of Unisol cleaning compound, a 6-ounce tube of B½ sealant (PR 1826), 1 to 2 ounces of polyurethane (PR 1561) to protect the sealant, and 1 ounce of promoter (PR 148) to enhance the adhering capability of the sealant. This procedure is performed IAW TOs 1-1-3 and 1C-5A-2-5.
- Component repairs on refuel valves/housing, manifolds, the fuel pump housing, hardware (e.g., nuts, bolts, screws) are conducted once a month per aircraft. The entire process takes 24 hours. However, the space is entered for 2 to 3 hours to prepare the area for the repairs (e.g., move structural braces). The component repair/replacement takes 3 to 4 hours. All components need to be resealed. Each component requires 0.5 ounces of petrolatum grease for the o-rings, 1 pint of Unisol cleaning compound, a 6-ounce tube of B½ sealant (PR 1826), 1 to 2 ounces of polyurethane (PR 1561) to protect the sealant, and 1 ounce of promoter (PR 148) to enhance the adhering capability of the sealant. This procedure is performed IAW TOs 1-1-3 and 1C-5A-2-5.
- Removal/replacement of fuel quantity probes and wiring is performed once a month per fleet of C-5s. Each replacement takes approximately 12 hours. A series of fuel quantity probes are encased in several harnesses in the fuel tanks. During the repair, the entire harness is removed then replaced using mechanical clamps. No chemicals are used. This procedure is performed IAW TOs 1-1-3 and 1C-5A-2-5.

Only authorized materials, or materials that have been fully evaluated and approved by Installation Ground Safety (SEG), Installation Fire Department (CEF), and Bioenvironmental Engineering (BE) offices can be used within the integral fuel tanks. Hot work, such as grinding, welding or brazing in a permit-required confined space requires a confined space entry permit AND a hot work permit. Both permits must be reviewed and approved in writing by SEG, CEF, and BE prior to conducting any hot work in the space.

POTENTIAL HAZARDS

The following table, *Potential Hazards*, contains various hazards that could be encountered when performing permit-required confined space entries into the fuel tanks. The systems described in the table (e.g., fuel lines/valves, fuel drain pumps, fuel quantity probes with wiring, fuel scavenge ejectors/pumps) are closed/contained, and are hazardous if they are intentionally opened or a significant leak occurs. These conditions are unlikely due to personnel training and specific aircraft TOs and OIs that are strictly complied with. The TOs and OIs govern procedures such as lockout/tagout and system checks prior to entering the various areas of the aircraft.

TABLE 2. Potential Hazards (Integral Fuel Tanks-General)

POTENTIAL HAZARDS	
Hazard	Hazard Description
Combustibility	The fuel tanks have the potential to contain jet fuel and/or jet fuel vapors that are combustible.
Entrapment	The integral fuel tanks are extremely confined areas that contain several structural braces and fuel lines/pumps/valves throughout the space. This creates an entrapment hazard for entry personnel due to limited maneuverability and delayed egress.
Hazardous Materials Present	Jet fuel and/or fuel vapors may be present in various cavities of the space. Jet fuel and its constituents (e.g., benzene, toluene, xylene) can be a potential hazard to the entrant by route of inhalation, skin absorption, ingestion, and contact.
Introduction of Hazardous Materials	The solvents and cleaners used for cleaning, and adhesives used for sealing the tanks, could potentially include hazardous materials. Only authorized chemicals should be used within the integral fuel tanks.
Oxygen Deficiency	Oxygen deficiency caused by oxygen displacement is a potential hazard due to unfavorable ventilation, fuel vapors, and nitrogen from fuel lines/components. In addition, several operations require the use of solvents, cleaners, and/or adhesives. Depending on the quantity and duration of use, the constituents of the chemicals could displace the oxygen within the space.
Temperature Extremes	Temperature extremes may present a hazard due to one or a combination of several factors such as ambient temperature, radiant heat, local winds, support equipment, and PPE.
Unfavorable Natural Ventilation	Due to the small entry access, there is normally minimal natural ventilation within the space.

RECOMMENDED ENGINEERING/ADMINISTRATIVE CONTROLS

The following engineering and administrative controls should be in place prior to making permit-required confined space entries into fuel tanks:

- **Depuddling:** Fuel tanks will be defueled, drained, depuddled, and purged to the extent necessary to perform the required tasks.
- **Electrical:** Except for specific depot exclusions, the aircraft electrical system shall be deenergized and locked and tagged out prior to opening integral fuel tanks. The aircraft should also be grounded and bonded prior to entry.
- **Lockout/Tagout:** Lockout/tagout procedures must be performed on electrical and mechanical systems prior to entry. Danger tags are placed on the relevant circuit breakers, batteries, and external power. The hydraulic systems are disabled, and pressure limiters are used on the nitrogen system. Restricted areas are established to minimize foot traffic. Pressure limiters monitor and control the nitrogen pressure in the fuel tanks by opening and closing the dewar isolation valves. There are two pressure limiters, one for each set of wing fuel tanks, mounted on the ceiling of the cargo compartment (between the wings). The pressure limiters also have a pull lever used to manually shut off the dewar isolation valves.
- **Ventilation:** Fuel tanks shall be ventilated for 30 minutes prior to space occupancy. Ventilation must be used as necessary to ensure safe atmospheric conditions during entry.
- **Administrative:** Personnel should minimize the time spent in confined spaces by performing only necessary tasks within the space. Any work that can be conducted outside of the space should not be performed during the entry.

RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE must be assigned based on the atmospheric conditions of the confined space, the physical hazards present, the task being performed, and the hazardous materials being used. Protective equipment that may be used for tasks in this space include:

- respiratory protection,
- non-absorbent coveralls,
- approved footwear,
- disposable nitrile or neoprene gloves,
- cap or head covering,
- goggles or safety glasses with side shields, and
- neoprene rubber knee pads, elbow pads, or mats.

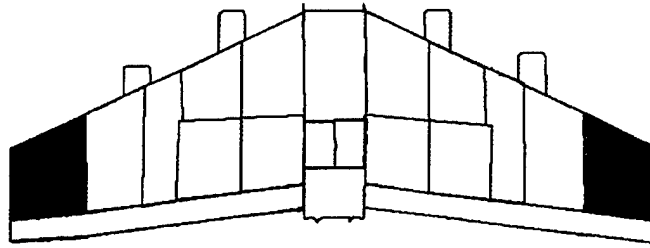
RECOMMENDED EMERGENCY EQUIPMENT

The following emergency equipment is recommended to be present in the Fuels or Flightline Maintenance area and verified to be in working condition by the designated entry authority prior to authorizing confined space entries:

- intrinsically safe hand radio,
- 150 pound halon fire extinguisher,
- intrinsically safe flashlights, lamps, or lanterns rated for class I, division 1 hazardous atmospheres,
- additional respiratory protection as recommended by BE, and
- rescue webbing harness.

C-5 GALAXY

INTEGRAL FUEL TANKS – MAIN (1, 4)



SPACE DESCRIPTION

There is a single main integral fuel tank (1, 4) on each wing of the C-5 aircraft (two tanks total) that can be bodily entered from waist up by maintenance personnel. Main fuel tanks feed fuel to the engines. They are located at the end of the wing next to the auxiliary integral fuel tanks (1, 4). Each tank contains fuel lines charged with nitrogen, fuel level control valves, fuel check valves, fuel drain pumps, fuel quantity probes with wiring, fuel scavenge ejectors/pumps, and hydraulic lines.

INNER DIMENSIONS

Length (outboard to inboard) = 32.0'
Width (leading to trailing edge) = 8.0' to 9.5'
Depth = 18.0" to 23.0"

ENTRY DIMENSIONS

Length = 19.0" Width = 15.0"
(oval entrance)

[The depth is the distance from the entrance to the most distant point.]

SPACE ACCESS/INNER AREA

Each main fuel tank has a single oval access located on the bottom of the wing.

RECOMMENDED CLASSIFICATION

Permit-required confined space.

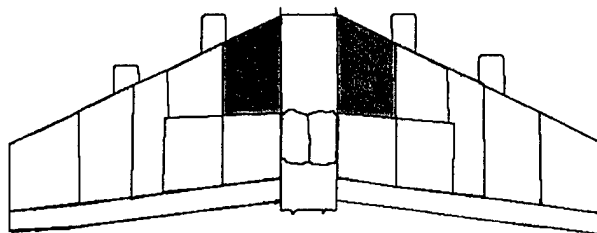
JUSTIFICATION FOR CLASSIFICATION

The main fuel tanks are permit-required due to the following conditions:

- contains or has the potential to contain a hazardous atmosphere (e.g., fuel and its constituents, nitrogen from fuel lines), and
- has an internal configuration such that an entrant could be trapped or asphyxiated (e.g., limited space congested with fuel lines/pumps/valves, hydraulic lines, and support braces/ribs).

C-5 GALAXY

INTEGRAL FUEL TANKS – MAIN (2, 3)



SPACE DESCRIPTION

There is a single main integral fuel tank (2, 3) on each wing of the C-5 aircraft (two tanks total) that can be entered completely by maintenance personnel. Main fuel tanks feed fuel to the engines. They are located inboard to the auxiliary integral fuel tanks (2, 3), and forward to the extended range integral fuel tanks (2, 3). Each tank contains fuel lines charged with nitrogen, fuel level control valves, fuel check valves, fuel drain pumps, fuel quantity probes with wiring, fuel scavenge ejectors/pumps, and hydraulic lines.

INNER DIMENSIONS

Length (outboard to inboard) = 23.0'
Width (leading to trailing edge) = 7.5' to 10.5'
Depth = 37.0" to 48.0"

ENTRY DIMENSIONS

Length = 19.0" Width = 15.0"
(oval entrance)

[The depth is the distance from the entrance to the most distant point.]

SPACE ACCESS/INNER AREA

Each main fuel tank has a single top access located on top of the wing.

RECOMMENDED CLASSIFICATION

Permit-required confined space.

JUSTIFICATION FOR CLASSIFICATION

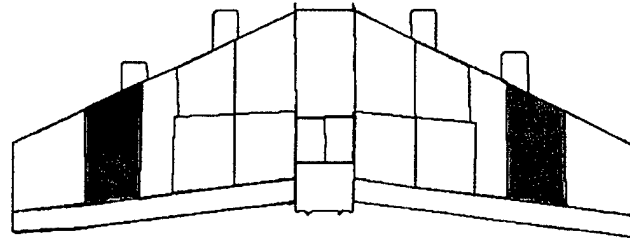
The main fuel tanks are permit-required due to the following conditions:

- contains or has the potential to contain a hazardous atmosphere (e.g., fuel and its constituents, nitrogen from fuel lines), and

- has an internal configuration such that an entrant could be trapped or asphyxiated (e.g., limited space congested with fuel lines/pumps/valves, hydraulic lines, and support braces/ribs).

C-5 GALAXY

INTEGRAL FUEL TANKS – AUXILARY (1, 4)



SPACE DESCRIPTION

There is a single auxiliary integral fuel tank (1, 4) on each wing of the C-5 aircraft (two tanks total) that can be entered completely by maintenance personnel. Auxiliary fuel tanks store and transfer fuel to the main integral fuel tanks. These tanks are located between the main integral fuel tanks (1, 4) and the wing dry bays (left/right). Each tank contains fuel lines charged with nitrogen, fuel level control valves, fuel check valves, fuel drain pumps, fuel quantity probes with wiring, fuel scavenge ejectors/pumps, and hydraulic lines.

INNER DIMENSIONS

Length (outboard to inboard) = 22.5'
Width (leading to trailing edge) = 9.5' to 11.5'
Depth = 23.0" to 32.0"

ENTRY DIMENSIONS

Length = 19.0" Width = 15.0"
Length = 25.0" Width = 15.0"
(both entrances are oval)

[The depth is the distance from the entrance to the most distant point.]

SPACE ACCESS/INNER AREA

Each auxiliary fuel tank has a bottom access (19.0" x 15.0") located underneath wing. A slightly larger side access (25.0" x 15.0") is located on the wall separating the auxiliary fuel tank and the wing dry bay (inboard auxiliary tank wall).

RECOMMENDED CLASSIFICATION

Permit-required confined space.

JUSTIFICATION FOR CLASSIFICATION

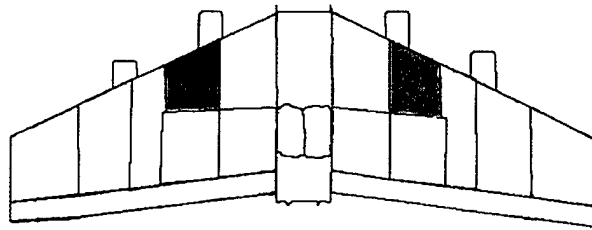
The auxiliary fuel tanks are permit-required due to the following conditions:

- contains or has the potential to contain a hazardous atmosphere (e.g., fuel and its constituents, nitrogen from fuel lines), and

- has an internal configuration such that an entrant could be trapped or asphyxiated (e.g., limited space congested with fuel lines/pumps/valves, hydraulic lines, and support braces/ribs).

C-5 GALAXY

INTEGRAL FUEL TANKS – AUXILARY (2, 3)



SPACE DESCRIPTION

There is a single auxiliary integral fuel tank (2, 3) on each wing of the C-5 aircraft (two tanks total) that can be entered completely by maintenance personnel. Auxiliary fuel tanks store and transfer fuel to the main integral fuel tanks. These tanks are located between the wing dry bays (left/right) and the main integral fuel tanks (2, 3), and are forward to the extended range integral fuel tanks (1, 4). Each tank contains fuel lines charged with nitrogen, fuel level control valves, fuel check valves, fuel drain pumps, fuel quantity probes with wiring, fuel scavenge ejectors/pumps, and hydraulic lines.

INNER DIMENSIONS

Length (outboard to inboard) = 16.0'
Width (leading to trailing edge) = 7.5' to 12.0'
Depth = 32.0" to 37.0"

ENTRY DIMENSIONS

Length = 19.0" Width = 15.0"
(oval entrance)

[The depth is the distance from the entrance to the most distant point.]

SPACE ACCESS/INNER AREA

Each auxiliary fuel tank has a bottom access located underneath the wing.

RECOMMENDED CLASSIFICATION

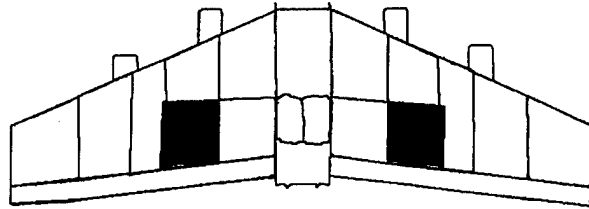
Permit-required confined space.

JUSTIFICATION FOR CLASSIFICATION

The auxiliary fuel tanks are permit-required due to the following conditions:

- contains or has the potential to contain a hazardous atmosphere (e.g., fuel and its constituents, nitrogen from fuel lines), and
- has an internal configuration such that an entrant could be trapped or asphyxiated (e.g., limited space congested with fuel lines/pumps/valves, hydraulic lines, and support braces/ribs).

INTEGRAL FUEL TANKS – EXTENDED RANGE (1, 4)



SPACE DESCRIPTION

There is a single extended range integral fuel tank (1, 4) on each wing of the C-5 aircraft (two tanks total) that can be entered completely by maintenance personnel. Extended range fuel tanks store and transfer fuel to the main integral fuel tanks. These tanks are located between the wing dry bays (left/right) and the extended range fuel tanks (2, 3), and are aft of the auxiliary integral fuel tanks (2, 3). Each tank contains fuel lines charged with nitrogen, fuel level control valves, fuel check valves, fuel drain pumps, fuel quantity probes with wiring, fuel scavenge ejectors/pumps, and hydraulic lines.

INNER DIMENSIONS

Length (outboard to inboard) = 7.0'
Width (leading to trailing edge) = 16.0'
Depth = 32.0" to 37.0"

ENTRY DIMENSIONS

Length = 19.0" Width = 15.0"
(oval entrance)

[The depth is the distance from the entrance to the most distant point.]

SPACE ACCESS/INNER AREA

Each extended range fuel tank has a single oval access located on the top of the wing.

RECOMMENDED CLASSIFICATION

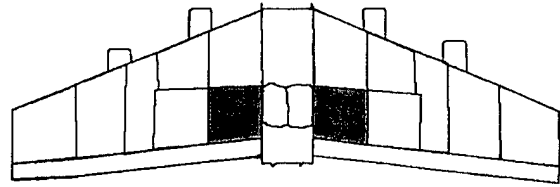
Permit-required confined space.

JUSTIFICATION FOR CLASSIFICATION

The extended range fuel tanks are permit-required due to the following conditions:

- contains or has the potential to contain a hazardous atmosphere (e.g., fuel and its constituents, nitrogen from fuel lines), and
- has an internal configuration such that an entrant could be trapped or asphyxiated (e.g., limited space congested with fuel lines/pumps/valves, hydraulic lines, and support braces/ribs).

INTEGRAL FUEL TANKS – EXTENDED RANGE (2, 3)



SPACE DESCRIPTION

There is a single extended range integral fuel tank (2, 3) on each wing of the C-5 aircraft (two tanks total) that can be entered completely by maintenance personnel. Extended range fuel tanks store and transfer fuel to the main integral fuel tanks. These tanks are located inboard to the extended range integral fuel tanks (1, 4), and aft of the main integral tanks (2, 3). Each tank contains fuel lines charged with nitrogen, fuel level control valves, fuel check valves, fuel drain pumps, fuel quantity probes with wiring, fuel scavenge ejectors/pumps, and hydraulic lines.

INNER DIMENSIONS

Length (outboard to inboard) = 19.0'
Width (leading to trailing edge) = 7.0' to 9.0'
Depth = 37.0" to 48.0"

ENTRY DIMENSIONS

Length = 19.0" Width = 15.0"
(oval entrance)

[The depth is the distance from the entrance to the most distant point.]

SPACE ACCESS/INNER AREA

Each extended range fuel tank has a single oval access located on the top of the wing.

RECOMMENDED CLASSIFICATION

Permit-required confined space.

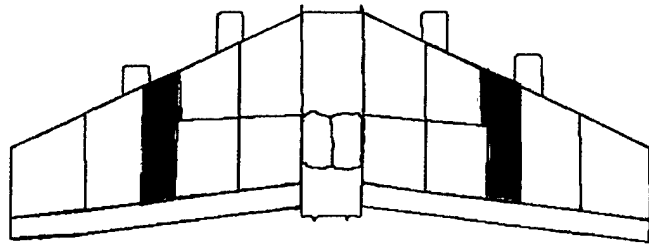
JUSTIFICATION FOR CLASSIFICATION

The extended range fuel tanks are permit-required due to the following conditions:

- contains or has the potential to contain a hazardous atmosphere (e.g., fuel and its constituents, nitrogen from fuel lines), and
- has an internal configuration such that an entrant could be trapped or asphyxiated (e.g., limited space congested with fuel lines/pumps/valves, hydraulic lines, and support braces/ribs).

C-5 GALAXY

WING DRY BAYS – (LEFT/RIGHT)



SPACE DESCRIPTION

There is a single wing dry bay (left/right) on each wing of the C-5 aircraft (two wing dry bays total) that can be entered completely by maintenance personnel. The wing dry bays are designed with seal planes, which provide airtight dividers between the dry bays and the surrounding sides of the integral fuel tanks. They are sealed with gaskets, structural adhesives, elastic films, or other sealants. The wing dry bays are located inboard to the auxiliary integral fuel tanks (1, 4), and outboard to the auxiliary fuel tanks (2, 3). Each wing dry bay contains fuel lines charged with nitrogen, electrically operated fuel shutoff valves (separation valves), fire-suppression system (FSS) lines, pressure switches, pressure transmitters, and hydraulic pressure systems/lines (3,000 psi). The fuel lines are vented with nitrogen (inert gas) in order to pressurize the fuel system to fill the empty headspaces. They contain fuel, nitrogen, or both at all times.

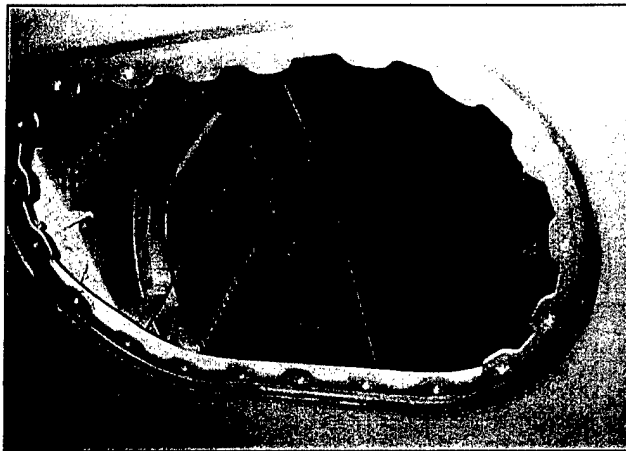


Figure 2. Wing Dry Bay: Bottom access & inner side access.

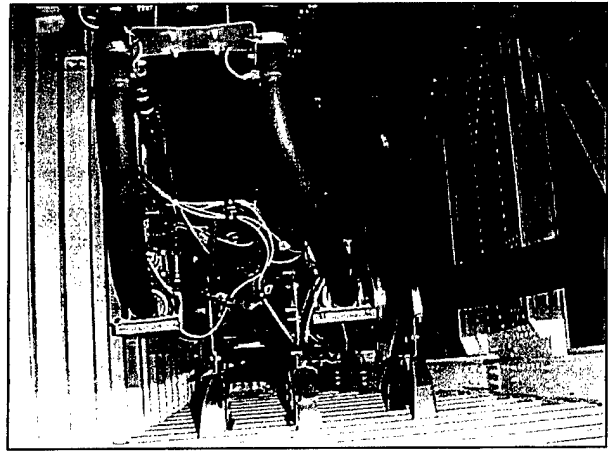


Figure 3. Wing Dry Bay: Inside.

INNER DIMENSIONS

Length (outboard to inboard) = 8.0'
Width (leading to trailing edge) = 11.5' to 12.0'
Depth = 20.0" to 32.0"

ENTRY DIMENSIONS

1. Length = 20.5" Width = 11.5"
2. Length = 25.0" Width = 15.0"
(both entrances are oval)

[The depth is the distance from the entrance to the most distant point.]

SPACE ACCESS/INNER AREA

Each wing dry bay has a bottom access (20.5" by 11.5") located underneath the wing. There is a slightly larger side access on the outboard wall that leads into the auxiliary integral fuel tank (1, 4).

RECOMMENDED CLASSIFICATION

Permit-required confined space.

JUSTIFICATION FOR CLASSIFICATION

The wing dry bays are permit-required due to the following conditions:

- contains or has the potential to contain a hazardous atmosphere (e.g., fuel and its constituents, nitrogen from fuel and FSS lines), and
- contains other recognized serious or health hazards (e.g., fuel lines/pumps/valves, electrically operated fuel shutoff valves), and
- has an internal configuration such that an entrant could be trapped or asphyxiated (e.g., limited space congested with fuel lines/pumps/valves, hydraulic lines, electrical wires, and support braces).

TASKS PERFORMED WITHIN THE SPACE

Personnel from several work centers can enter the wing dry bays to perform both general and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following tasks may be performed during scheduled and routine maintenance:

- New seals on each aircraft are installed once a month. The entire process takes 24 hours. However, the space is entered for 2 to 3 hours to prepare the area for the repairs (e.g., move structural braces). The seal installation takes 3 to 4 hours. Each installation requires 0.5 ounces of petrolatum grease for the o-rings, 1 pint of Unisol cleaning compound, a 6-ounce tube of B½ sealant (PR 1826), 1 to 2 ounces of polyurethane (PR 1561) to protect the sealant, and 1 ounce of promoter (PR 148) to enhance the adhering capability of the sealant.

- Troubleshooting a fuel leak occurs approximately once a week. After the aircraft is prepared for entry, the procedure takes 1 to 2 hours to isolate the leak. Talcum powder is used to locate the leak.
- Troubleshooting electrical wires occurs once every 480 days per aircraft. The procedure takes 1 to 2 hours, and is conducted IAW TO 1C-5A-2-6, C-5 A & B *Instruments*.
- Each week three seam structural leaks are performed. The entire process takes 24 hours. However, the entry duration is approximately 4 hours. After the aircraft has been safely purged, the tank is entered to visually locate the leak(s) from the panel edges. The defective sealant is removed before the new sealant is installed. Each seam leak requires 1 pint of Unisol cleaning compound, a 6-ounce tube of B½ sealant (PR 1826), 1 to 2 ounces of polyurethane (PR 1561) to protect the sealant, and 1 ounce of promoter (PR 148) to enhance the adhering capability of the sealant. This procedure is performed IAW TOs 1-1-3 and 1C-5A-2-5.

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the wing dry bays. Hot work, such as grinding, welding or brazing in a permit-required confined space requires a confined space entry permit AND a hot work permit. Both permits must be reviewed and approved in writing by SEG, CEF, and BE prior to conducting any hot work in the space.

POTENTIAL HAZARDS

The following table, *Potential Hazards*, contains various hazards that could be encountered when performing permit-required confined space entries into the wing dry bays. The systems described in the table (e.g., fuel lines/valves/pumps, hydraulic lines, FFS lines) are closed/contained, and are hazardous if they are intentionally opened or a significant leak occurs. These conditions are unlikely due to personnel training and specific aircraft TOs and OIs that are strictly complied with. The TOs and OIs govern procedures such as lockout/tagout and system checks prior to entering the various areas of the aircraft.

TABLE 3. Potential Hazards (Wing Dry Bays)

POTENTIAL HAZARDS	
Hazard	Hazard Description
Combustibility	The wing dry bays have the potential to contain jet fuel and/or jet fuel vapors that are combustible.
Electrical	There are electrically operated fuel shutoff valves (separation valves) within the space.
Entrapment	The wing dry bays are extremely confined areas that contain several structural braces, fuel lines/pumps/valves, hydraulic lines, and FSS lines throughout the space. This creates an entrapment hazard for entry personnel due to limited maneuverability and egress.
Hazardous Materials Present	Jet fuel and/or fuel vapors may be present in various cavities of the space. Jet fuel and its constituents (e.g., benzene, toluene, xylene) can be a potential hazard to the entrant by route of inhalation, skin absorption, ingestion, and contact.
Introduction of Hazardous Materials	The solvents and cleaners used for cleaning, and adhesives used for sealing the tanks, could potentially include hazardous materials. Only authorized chemicals should be used within the space.
Oxygen Deficiency	Oxygen deficiency caused by oxygen displacement is a potential hazard due to unfavorable ventilation, fuel vapors, and nitrogen from fuel and FSS lines/components. In addition, several operations require the use of solvents, cleaners, and/or adhesives. Depending on the quantity and duration of use, the constituents of the chemicals could displace the oxygen within the space.
Temperature Extremes	Temperature extremes may present a hazard due to one or a combination of several factors such as ambient temperature, radiant heat, local winds, support equipment, and PPE.
Unfavorable Natural Ventilation	Due to the small entrances into the wing dry bays, there is normally minimal natural ventilation within these spaces.

RECOMMENDED ENGINEERING/ADMINISTRATIVE CONTROLS

The following engineering and administrative controls should be in place prior to making permit-required confined space entries into the wing dry bays:

- **Electrical:** Except for specific depot exclusions, the aircraft electrical system shall be deenergized and locked and tagged out prior to opening the wing dry bays. The aircraft should also be grounded and bonded prior to entry.
- **Lockout/Tagout:** Lockout/tagout procedures must be performed on electrical and mechanical systems prior to entry. Danger tags are placed on the relevant circuit breakers, batteries, and external power. The hydraulic systems are disabled, and pressure limiters are used on the nitrogen system. Restricted areas are established to minimize foot traffic. Pressure limiters monitor and control the nitrogen pressure in the fuel tanks by opening and closing the dewar isolation valves. There are two pressure limiters, one for each set of wing fuel tanks, mounted on the ceiling of the cargo compartment (between the wings).

The pressure limiters also have a pull lever used to manually shut off the dewar isolation valves.

- **Ventilation:** Ventilating a confined space before entry is not necessary if atmospheric monitoring results are acceptable. Atmospheric monitoring will be performed prior to entry and continuously thereafter. However, the entry authority can and should use ventilators to maintain acceptable air quality within the space during the entry if necessary.
- **Administrative:** Personnel should minimize the time spent in confined spaces by performing only necessary tasks within the space. Any work that can be conducted outside of the space should not be performed during the entry.

RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE must be assigned based on the atmospheric conditions of the confined space, the physical hazards present, the task being performed, and the hazardous materials being used. Protective equipment that may be used for tasks in this space include:

- respiratory protection,
- coveralls,
- approved footwear,
- disposable nitrile or neoprene gloves,
- cap or head covering,
- goggles or safety glasses with side shields, and
- neoprene rubber knee pads, elbow pads, or mats.

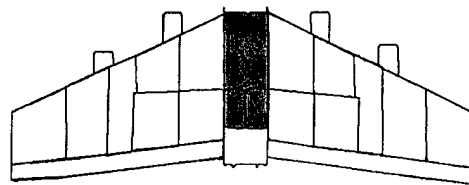
RECOMMENDED EMERGENCY EQUIPMENT

The following emergency equipment is recommended to be present in the Fuels or Flightline Maintenance area and verified to be in working condition by the designated entry authority prior to authorizing confined space entries:

- intrinsically safe hand radio,
- 150 pound halon fire extinguisher,
- intrinsically safe flashlights, lamps, or lanterns rated for class I, division 1 hazardous atmospheres,
- additional respiratory protection as recommended by BE, and
- rescue webbing harness.

C-5 GALAXY

CENTER WING ROOT DRY BAYS – FORWARD & AFT (LEFT/RIGHT)



SPACE DESCRIPTION

There are a total of four center wing root dry bays. The forward and aft center wing root dry bays (left/right) are located between the left and right upper wing root areas. These dry bays are designed with seal planes, which provide airtight dividers between the dry bays and the surrounding sides of the integral fuel tanks. They are sealed with gaskets, structural adhesives, elastic films, or other sealants. Each center wing dry bay contains fuel lines charged with nitrogen, single point refueling (SPR) lines [left side only], in-flight refueling (IFR) lines [right side only] electrically operated fuel shutoff valves (separation valves), fuel pressure transmitters, auxiliary power units, and hydraulic pressure systems/lines [3,000 psi]. The fuel lines are vented with nitrogen (inert gas) in order to pressurize the fuel system to fill the empty headspaces. They contain fuel, nitrogen, or both at all times.

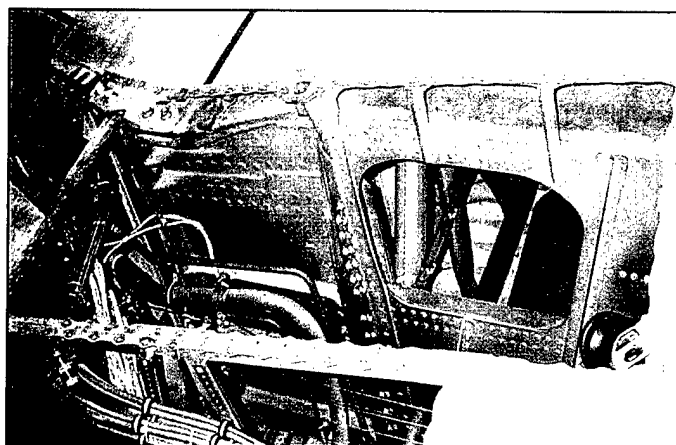


Figure 4. Fwd Center Wing Root Dry Bay: Fwd access in right fuel manifold area.

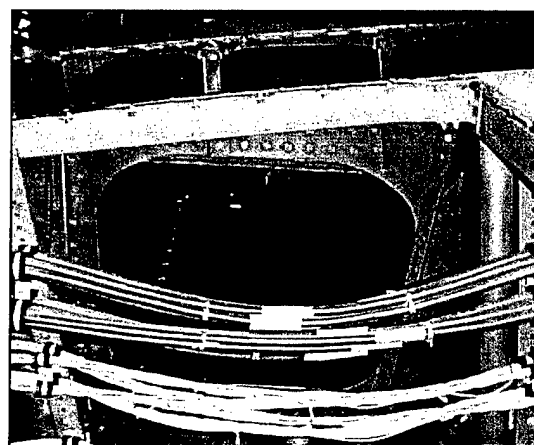


Figure 5. Fwd Center Wing Root Dry Bay: Fwd access (close up).

INNER DIMENSIONS

Cannot be determined.

ENTRY DIMENSIONS

1. Forward: Length = 19.5" Width = 15.0"
2. Center: Cannot be determined
3. Aft: Cannot be determined
(the forward access is rectangular/oval)

SPACE ACCESS/INNER AREA

The forward center wing root dry bays have a rectangular/oval shaped side access (forward access) located between the aft wall of the right fuel manifold area and the forward wall of the forward center wing dry bay. There is a center side access on the wall dividing the forward center wing dry bay with the aft center wing dry bay. The aft access is a side access located on the aft wall of the aft center wing dry bay. The center access, aft access, and inner dimensions cannot be determined unless the space is entered.

RECOMMENDED CLASSIFICATION

Permit-required confined space.

JUSTIFICATION FOR CLASSIFICATION

The center wing root dry bays are permit-required due to the following conditions:

- contains or has the potential to contain a hazardous atmosphere (e.g., fuel and its constituents, nitrogen from fuel lines), and
- contains other recognized serious or health hazards (e.g., fuel lines/pumps, electrically operated fuel shutoff valves, electrical auxiliary power units), and
- has an internal configuration such that an entrant could be trapped or asphyxiated (e.g., limited space congested with fuel lines/pumps/valves, hydraulic lines, and support braces/ribs).

TASKS PERFORMED WITHIN THE SPACE

Personnel from several work centers can enter the center wing root dry bays to perform both general and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following tasks may be performed during scheduled and routine maintenance:

- New seals on each aircraft are installed once a month. The entire process takes 24 hours. However, the space is entered for 2 to 3 hours to prepare the area for the repairs (e.g., move structural braces). The seal installation takes 3 to 4 hours. Each installation requires 0.5 ounces of petrolatum grease for the o-rings, 1 pint of Unisol cleaning compound, a 6-ounce tube of B $\frac{1}{2}$ sealant (PR 1826), 1

to 2 ounces of polyurethane (PR 1561) to protect the sealant, and 1 ounce of promoter (PR 148) to enhance the adhering capability of the sealant.

- Troubleshooting a fuel leak occurs approximately once a week. After the aircraft is prepared for entry, the procedure takes 1 to 2 hours to isolate the leak. Talcum powder is used to locate the leak.
- Troubleshooting electrical wires occurs once every 480 days per aircraft. The procedure takes 1 to 2 hours, and is conducted IAW TO 1C-5A-2-6, C-5 A & B *Instruments*.
- Each week three seam structural leaks are performed. The entire process takes 24 hours. However, the entry duration is approximately 4 hours. After the aircraft has been safely purged, the tank is entered to visually locate the leak(s) from the panel edges. The defective sealant is removed before the new sealant is installed. Each seam leak requires 1 pint of Unisol cleaning compound, a 6-ounce tube of B½ sealant (PR 1826), 1 to 2 ounces of polyurethane (PR 1561) to protect the sealant, and 1 ounce of promoter (PR 148) to enhance the adhering capability of the sealant. This procedure is performed IAW TOs 1-1-3 and 1C-5A-2-5.

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the center wing root dry bays. Hot work, such as grinding, welding or brazing in a permit-required confined space requires a confined space entry permit AND a hot work permit. Both permits must be reviewed and approved in writing by SEG, CEF, and BE prior to conducting any hot work in the space.

POTENTIAL HAZARDS

The following table, *Potential Hazards*, contains various hazards that could be encountered when performing permit-required confined space entries into the center wing root dry bays. The systems described in the table (e.g., SPR lines, IFR lines, various fuel lines/valves/pumps, hydraulic lines [3,000 psi], electrical shutoff valves/auxiliary power units) are closed/contained, and are hazardous if they are intentionally opened or a significant leak occurs. These conditions are unlikely due to personnel training and specific aircraft TOs and OIs that are strictly complied with. The TOs and OIs govern procedures such as lockout/tagout and system checks prior to entering the various areas of the aircraft.

TABLE 4. Potential Hazards (Center Wing Root Dry Bays)

POTENTIAL HAZARDS	
Hazard	Hazard Description
Combustibility	The center wing root dry bays have the potential to contain jet fuel and/or jet fuel vapors that are combustible.
Electrical	There are electrically operated fuel shutoff valves (separation valves) and auxiliary power units within the space.
Entrapment	The center wing root dry bays are extremely confined areas that contain several structural braces, fuel lines/pumps/valves, hydraulic lines, and FSS lines throughout the space. This creates an entrapment hazard for entry personnel due to limited maneuverability and egress.
Hazardous Materials Present	Jet fuel and/or fuel vapors may be present in various cavities of the space. Jet fuel and its constituents (e.g., benzene, toluene, xylene) can be a potential hazard to the entrant by route of inhalation, skin absorption, ingestion, and contact.
Introduction of Hazardous Materials	The solvents and cleaners used for cleaning, and adhesives used for sealing the tanks, could potentially include hazardous materials. Only authorized chemicals should be used within the space.
Oxygen Deficiency	Oxygen deficiency caused by oxygen displacement is a potential hazard due to unfavorable ventilation, fuel vapors, and nitrogen from fuel and FSS lines/components. In addition, several operations require the use of solvents, cleaners, and/or adhesives. Depending on the quantity and duration of use, the constituents of the chemicals could displace the oxygen within the space.
Temperature Extremes	Temperature extremes may present a hazard due to one or a combination of several factors such as ambient temperature, radiant heat, local winds, support equipment, and PPE.
Unfavorable Natural Ventilation	Due to the small entry access into the center wing root dry bays, there is normally minimal natural ventilation.

RECOMMENDED ENGINEERING/ADMINISTRATIVE CONTROLS

The following engineering and administrative controls should be in place prior to making permit-required confined space entries into the center wing root dry bays:

- **Electrical:** Except for specific depot exclusions, the aircraft electrical system shall be deenergized and locked and tagged out prior to opening the center wing root dry bays. The aircraft should also be grounded and bonded prior to entry.
- **Lockout/Tagout:** Lockout/tagout procedures must be performed on electrical and mechanical systems prior to entry. Danger tags are placed on the relevant circuit breakers, batteries, and external power. The hydraulic systems are disabled, and pressure limiters are used on the nitrogen system. Restricted areas are established to minimize foot traffic. Pressure limiters monitor and control the nitrogen pressure in the fuel tanks by opening and closing the dewar isolation valves. There are two pressure limiters, one for each set of wing fuel

tanks, mounted on the ceiling of the cargo compartment (between the wings). The pressure limiters also have a pull lever used to manually shut off the dewar isolation valves.

- **Ventilation:** Ventilating a confined space before entry is not necessary if atmospheric monitoring results are acceptable. Atmospheric monitoring will be performed prior to entry and continuously thereafter. However, the entry authority can and should use ventilators to maintain acceptable air quality within the space during the entry if necessary.
- **Administrative:** Personnel should minimize the time spent in confined spaces by performing only necessary tasks within the space. Any work that can be conducted outside of the space should not be performed during the entry.

RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE must be assigned based on the atmospheric conditions of the confined space, the physical hazards present, the task being performed, and the hazardous materials being used. Protective equipment that may be used for tasks in this space include:

- respiratory protection,
- coveralls,
- approved footwear,
- disposable nitrile or neoprene gloves,
- cap or head covering,
- goggles or safety glasses with side shields, and
- neoprene rubber knee pads, elbow pads, or mats.

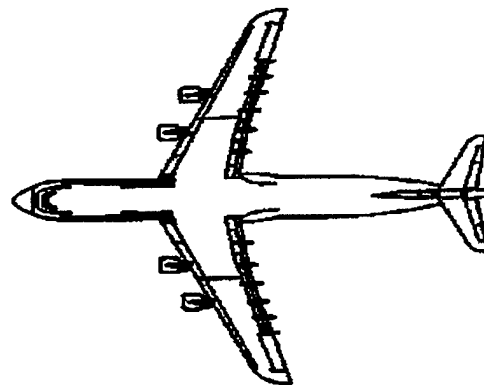
RECOMMENDED EMERGENCY EQUIPMENT

The following emergency equipment is recommended to be available and verified to be in working condition by the designated entry authority prior to authorizing confined space entry into the center wing root dry bays:

- intrinsically safe hand radio,
- 150 pound halon fire extinguisher,
- intrinsically safe flashlights, lamps, or lanterns rated for class I, division 1 hazardous atmospheres,
- additional respiratory protection as recommended by BE, and
- rescue webbing harness.

C-5 GALAXY

FUEL MANIFOLD AREA – RIGHT & LEFT



SPACE DESCRIPTION

The fuel manifold areas are located in front of the forward center wing root dry bays (left/right), between the wings. There are two fuel manifold areas (left/right). The right fuel manifold area contains the in-flight refueling (IFR) lines/components, and the left fuel manifold area contains the single point refueling (SPR) lines/components. Both sides contain fuel lines charged with nitrogen, manifold drain pumps/lines, bleed lines, hydraulic lines [3,000 psi], throttle/fuel shutoff cables, and torque tubes (slat driven system similar to wing flaps). The fuel lines are vented with nitrogen (inert gas) in order to pressurize the fuel system to fill the empty headspaces. They contain fuel, nitrogen, or both at all times.



Figure 6. Right Fuel Manifold Area: Top/fwd view with panels removed.

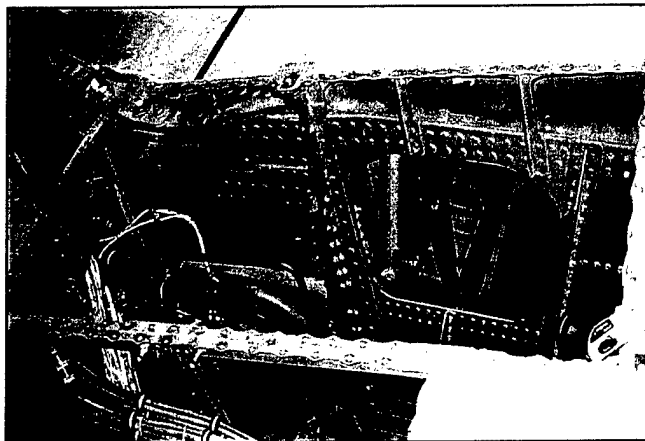


Figure 7. Right Fuel Manifold Area: Aft side access from fwd center wing dry bay.

INNER DIMENSIONS

Length (leading to trailing edge) = 21.5'
Width (outboard to inboard) = 7.0'
Depth = 5.5'

ENTRY DIMENSIONS

1. Side: Length = 19.5" Width = 15.0"
2. Top: various size panels.
(the side access is rectangular/oval)

[The depth is the distance from the entrance to the most distant point.]

SPACE ACCESS/INNER AREA

The left and right fuel manifold areas have an irregular shaped side entrance between the aft wall of the fuel manifold area and the forward center wing root dry bay. The top accesses are various shaped exterior panels. The sides and depth of the inner area tapers in the forward end of the spaces.

RECOMMENDED CLASSIFICATION

Permit-required confined space.

JUSTIFICATION FOR CLASSIFICATION

The fuel manifold areas are permit-required due to the following conditions:

- contains or has the potential to contain a hazardous atmosphere (e.g., fuel and its constituents, nitrogen from fuel lines), and
- contains other recognized serious or health hazards (e.g., fuel lines/pumps, mechanical hazard from torque tubes), and
- has an internal configuration such that an entrant could be trapped or asphyxiated (e.g., limited space congested with fuel components, hydraulic lines, and support braces/ribs).

However, if all of the top panels are removed, the space does not have a limited means of entry or egress and therefore not a confined space.

TASKS PERFORMED WITHIN THE SPACE

Personnel from several work centers can enter the fuel manifold areas to perform both general and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following tasks may be performed during scheduled and routine maintenance:

- A general inspection is conducted during every ISO Inspection (every 420 days) for each aircraft. Various components such as the IFR and SPR manifolds, fuel drain pumps/lines, etc. are visually inspected for cracks and weathering. No chemicals are used during the inspection. The procedure takes approximately 40 minutes, and is conducted IAW TO 1C-5A-2-5, WC 2-008.

- Operational checks are conducted during every ISO Inspection (every 420 days). IFR and SPR fuel manifold drain pumps are tested when the power is on in order to check its draining capabilities. No chemicals are used. The procedure takes approximately 40 minutes, and is conducted IAW TO 1C-5A-2-5, WC 2-008.

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the fuel manifold areas. Hot work, such as grinding, welding or brazing in a permit-required confined space requires a confined space entry permit AND a hot work permit. Both permits must be reviewed and approved in writing by SEG, CEF, and BE prior to conducting any hot work in the space.

POTENTIAL HAZARDS

The following table, *Potential Hazards*, contains various hazards that could be encountered when performing permit-required confined space entries into the fuel manifold areas. The systems described in the table (e.g., fuel components, hydraulic lines, throttle/fuel shutoff cables, torque tubes) are closed/contained, and are hazardous if they are intentionally opened or a significant leak occurs. These conditions are unlikely due to personnel training and specific aircraft TOs and OIs that are strictly complied with. The TOs and OIs govern procedures such as lockout/tagout and system checks prior to entering the various areas of the aircraft.

TABLE 5. Potential Hazards (Fuel Manifold Area)

POTENTIAL HAZARDS	
Hazard	Hazard Description
Combustibility	The fuel manifold areas have the potential to contain jet fuel and/or jet fuel vapors that are combustible.
Entrapment	The fuel manifold areas are extremely confined areas that contain several structural braces, fuel components, and hydraulic lines throughout the space. This creates an entrapment hazard for entry personnel due to limited maneuverability and egress. In addition, torque tubes can entrap an entrant.
Hazardous Materials Present	Jet fuel and/or fuel vapors may be present in various cavities of the space. Jet fuel and its constituents (e.g., benzene, toluene, xylene) can be a potential hazard to the entrant by route of inhalation, skin absorption, ingestion, and contact.
Mechanical	The slat driven torque tubes can trap and possibly grind the jammed areas of an entrant.
Oxygen Deficiency	Oxygen deficiency caused by oxygen displacement is a potential hazard due to unfavorable ventilation, fuel vapors, and nitrogen from fuel lines/components. In addition, several operations require the use of solvents, cleaners, and/or adhesives. Depending on the quantity and duration of use, the constituents of the chemicals could displace the oxygen within the space.
Temperature Extremes	Temperature extremes may present a hazard due to one or a combination of several factors such as ambient temperature, radiant heat, local winds, support equipment, and PPE.
Unfavorable Natural Ventilation	Due to the small entry access into the fuel manifold areas (depending on how many top panels are removed), there is normally minimal natural ventilation.

RECOMMENDED ENGINEERING/ADMINISTRATIVE CONTROLS

The following engineering and administrative controls should be in place prior to making entries into the right and left fuel manifold areas:

- **Lockout/Tagout:** Lockout/tagout procedures must be performed on electrical and mechanical systems prior to entry. Danger tags are placed on the relevant circuit breakers, batteries, and external power. The hydraulic systems are disabled, and pressure limiters are used on the nitrogen system. Restricted areas are established to minimize foot traffic. Pressure limiters monitor and control the nitrogen pressure in the fuel tanks by opening and closing the dewar isolation valves. There are two pressure limiters, one for each set of wing fuel tanks, mounted on the ceiling of the cargo compartment (between the wings). The pressure limiters also have a pull lever used to manually shut off the dewar isolation valves.
- **Ventilation:** Ventilating a confined space before entry is not necessary if atmospheric monitoring results are acceptable. Atmospheric monitoring will be performed prior to entry and continuously thereafter. However, the entry

authority can and should use ventilators to maintain acceptable air quality within the space during the entry if necessary.

- **Administrative:** Personnel should minimize the time spent in confined spaces by performing only necessary tasks within the space. Any work that can be conducted outside of the space should not be performed during the entry.

RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE must be assigned based on the atmospheric conditions of the confined space, the physical hazards present, the task being performed, and the hazardous materials being used. Protective equipment that may be used for tasks in this space include:

- respiratory protection,
- coveralls,
- approved footwear,
- disposable nitrile or neoprene gloves,
- cap or head covering,
- goggles or safety glasses with side shields, and
- neoprene rubber knee pads, elbow pads, or mats.

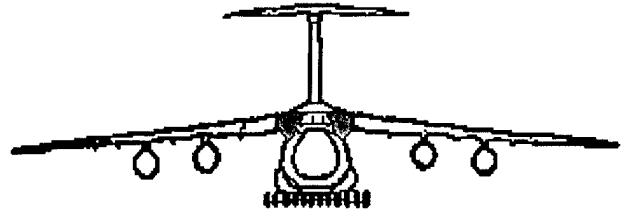
RECOMMENDED EMERGENCY EQUIPMENT

The following emergency equipment is recommended to be available and verified to be in working condition by the designated entry authority prior to authorizing confined space entry into the fuel manifold areas:

- intrinsically safe hand radio,
- 150 pound halon fire extinguisher,
- intrinsically safe flashlights, lamps, or lanterns rated for class I, division 1 hazardous atmospheres,
- additional respiratory protection as recommended by BE, and
- rescue webbing harness.

C-5 GALAXY

WING ROOT AREAS – LOWER & UPPER (LEFT/RIGHT)



SPACE DESCRIPTION

The C-5 has a lower and an upper wing root area on each side of the aircraft (left/right). The wing root is the space between the wing and the fuselage. The lower and upper wing root areas contain fire suppression system (FSS) lines, fuel lines, refuel valves, hydraulic lines [3,000 psi], torque tubes, and a dewar. A dewar is a barrel-like container storing 750 lbs of liquid nitrogen that is distributed to the integral fuel tanks and FSS by passing nitrogen gas through heat exchangers. A single dewar is located between the upper and lower wing root areas (aft end). The fuel lines are vented with nitrogen (inert gas) in order to pressurize the fuel system to fill the empty headspaces. They contain fuel, nitrogen, or both at all times.

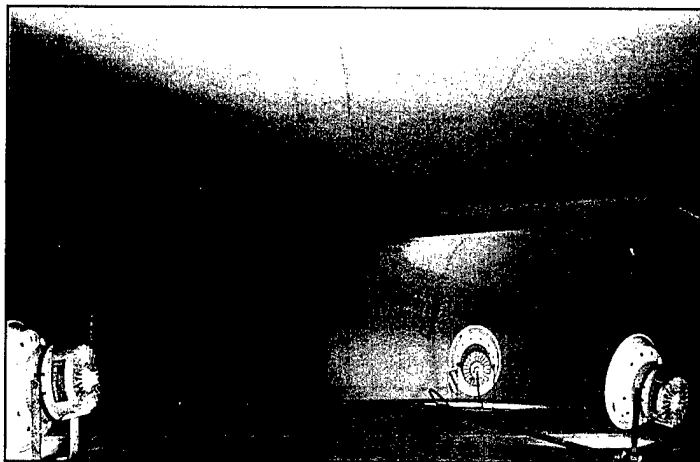


Figure 8. Lower Wing Root Area: Fwd & aft side panels removed.

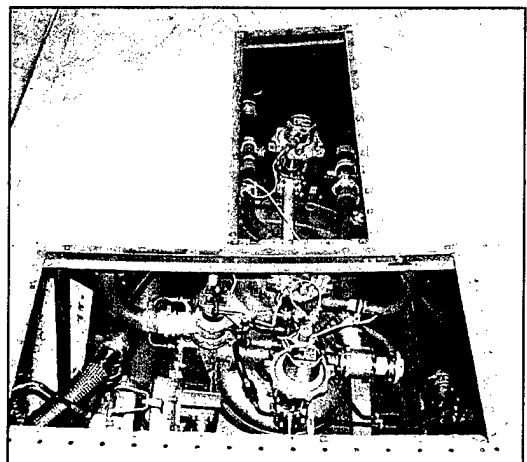


Figure 9. Upper Wing Root Area: Top of nitrogen tank (dewar) looking downward from the top of the aircraft.

INNER DIMENSIONS

Lower Wing Root

Depth (leading to trailing edge) = 22.0'
Height (top to bottom) = 3.5'
Length (bottom) = 6.0'
Width (top) = 4.0'

Upper Wing Root

Depth (leading to trailing edge) = 22.0'
Height (top to bottom) = 4.0'
Length (top) = 6.0'
Width (bottom) = 4.0'

ENTRY DIMENSIONS

The wing root areas do not have defined entrances. Entries into these spaces require removal of various external panels.

SPACE ACCESS/INNER AREA

The wing root areas are triangular shaped.

RECOMMENDED CLASSIFICATION

Permit-required confined space.

JUSTIFICATION FOR CLASSIFICATION

The wing root areas are permit-required due to the following conditions:

- contains or has the potential to contain a hazardous atmosphere (e.g., fuel and its constituents, nitrogen from fuel and FSS lines), and
- contains other recognized serious or health hazards (e.g., fuel lines/valves, mechanical hazard from torque tubes), and
- has an internal configuration such that an entrant could be trapped or asphyxiated (e.g., limited space congested with fuel components, hydraulic lines, FSS lines, and support braces).

If all of the panels are removed, the wing root areas do not have a limited means of entry or egress, and therefore, not a permit-required confined space.

TASKS PERFORMED WITHIN THE SPACE

Personnel from several work centers can enter the wing root areas to perform both general and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following tasks may be performed during scheduled and routine maintenance:

- The Electro Environmental shop performs a general inspection every ISO Inspection (every 420 days) for each aircraft. The dewar assembly (e.g, mounted components, electrical wiring, heat exchangers) is checked for leaks, and the interior structure is checked for corrosion and other defects. No chemicals are used during the inspection. The procedure takes approximately 4 hours, and is conducted IAW TO 1C-5A-6WC-5, WC 2-157, *Preflight Inspection – Isochronal*.
- The Fuel Systems shop inspects the refuel valves during each ISO Inspection (every 420 days). During the inspection, the wires are checked for corrosion. No chemicals are used during the inspection. The procedure takes approximately 1 hour, and is conducted IAW TO 1C-5A-6WC-5, *Preflight Inspection*.

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the wing root areas. Hot work, such as grinding, welding or brazing in a permit-required confined space requires a confined space entry permit AND a hot work permit. Both permits must be reviewed and approved in writing by SEG, CEF, and BE prior to conducting any hot work in the space.

POTENTIAL HAZARDS

The following table, *Potential Hazards*, contains various hazards that could be encountered when performing permit-required confined space entries into the wing root areas. The systems described in the table (e.g., FFS, fuel components, hydraulic lines, torque tubes) are closed/contained, and are hazardous if they are intentionally opened or a significant leak occurs. These conditions are unlikely due to personnel training and specific aircraft TOs and OIs that are strictly complied with. The TOs and OIs govern procedures such as lockout/tagout and system checks prior to entering the various areas of the aircraft.

TABLE 6. Potential Hazards (Wing Root Area)

POTENTIAL HAZARDS	
Hazard	Hazard Description
Combustibility	The wing root areas have the potential to contain jet fuel and/or jet fuel vapors that are combustible.
Electrical	There are electrical refuel valve wires in the wing root areas.
Entrapment	The wing root areas are extremely confined areas that contain several structural braces, FSS lines, fuel components, and hydraulic lines throughout the space. This creates an entrapment hazard for entry personnel due to limited maneuverability and egress. In addition, the torque tubes can also entrap an entrant.
Hazardous Materials Present	Jet fuel and/or fuel vapors may be present in various cavities of the space. Jet fuel and its constituents (e.g., benzene, toluene, xylene) can be a potential hazard to the entrant by route of inhalation, skin absorption, ingestion, and contact.
Mechanical	The torque tubes can trap and possibly grind the jammed portion of an entrant.
Oxygen Deficiency	Oxygen deficiency caused by oxygen displacement is a potential hazard due to unfavorable ventilation, fuel vapors, and nitrogen from fuel and FSS lines/components. In addition, several operations require the use of solvents, cleaners, and/or adhesives. Depending on the quantity and duration of use, the constituents of the chemicals could displace the oxygen within the space.
Temperature Extremes	Temperature extremes may present a hazard due to one or a combination of several factors such as ambient temperature, radiant heat, local winds, support equipment, and PPE.
Unfavorable Natural Ventilation	Due to the small entry access into the wing root areas (depending on how many top panels are removed), there is normally minimal natural ventilation.

RECOMMENDED ENGINEERING/ADMINISTRATIVE CONTROLS

The following engineering and administrative controls should be in place prior to making entries into the wing root areas:

- **Lockout/Tagout:** Lockout/tagout procedures must be performed on electrical and mechanical systems prior to entry. Danger tags are placed on the relevant circuit breakers, batteries, and external power. The hydraulic systems are disabled, and pressure limiters are used on the nitrogen system. Restricted areas are established to minimize foot traffic. Pressure limiters monitor and control the nitrogen pressure in the fuel tanks by opening and closing the dewar isolation valves. There are two pressure limiters, one for each set of wing fuel tanks, mounted on the ceiling of the cargo compartment (between the wings). The pressure limiters also have a pull lever used to manually shut off the dewar isolation valves.
- **Ventilation:** Ventilating a confined space before entry is not necessary if atmospheric monitoring results are acceptable. Atmospheric monitoring will be performed prior to entry and continuously thereafter. However, the entry

authority can and should use ventilators to maintain acceptable air quality within the space during the entry if necessary.

- **Administrative:** Personnel should minimize the time spent in confined spaces by performing only necessary tasks within the space. Any work that can be conducted outside of the space should not be performed during the entry.

RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE must be assigned based on the atmospheric conditions of the confined space, the physical hazards present, the task being performed, and the hazardous materials being used. Protective equipment that may be used for tasks in this space include:

- respiratory protection,
- coveralls,
- approved footwear,
- disposable nitrile or neoprene gloves,
- cap or head covering,
- goggles or safety glasses with side shields, and
- neoprene rubber knee pads, elbow pads, or mats.

RECOMMENDED EMERGENCY EQUIPMENT

The following emergency equipment is recommended to be available and verified to be in working condition by the designated entry authority prior to authorizing confined space entries into the wing root areas:

- intrinsically safe hand radio,
- 150 pound halon fire extinguisher,
- intrinsically safe flashlights, lamps, or lanterns rated for class I, division 1 hazardous atmospheres,
- additional respiratory protection as recommended by BE, and
- rescue webbing harness.

C-5 GALAXY

CENTER WING BOX

Not Shown
(Located Inside Aircraft)

SPACE DESCRIPTION

The center wing box is located in the Environmental Control Room ("Boiler Room"), aft of the crew area. The space contains a 4" in diameter fuel manifold, fire bottles (C-5 A-model), fuel wing manifold transmitter electrical lines (C-5 A-model), a slat-clutch brake assembly torque tube, and flight control cables. The fire bottles are filled with a freon-like substance called Bromo-trifluoro-methane (CF_3Br).

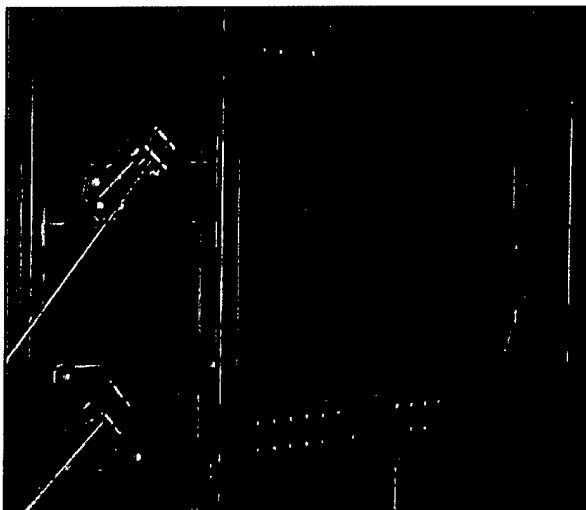


Figure 10. Center Wing Box: Access in the "Boiler Room".

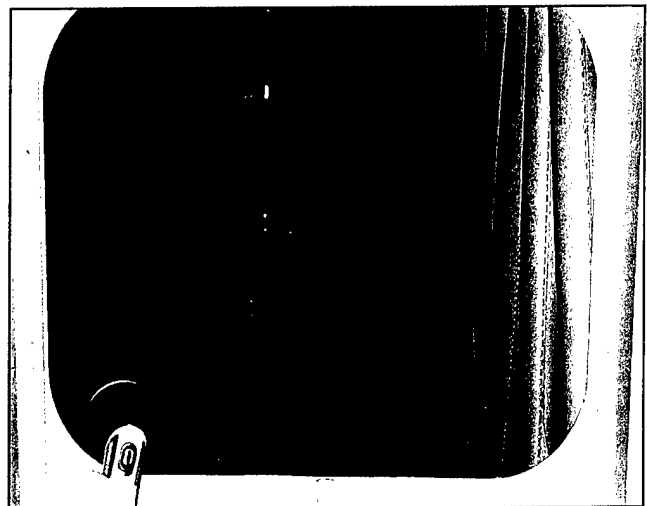


Figure 11. Center Wing Box: Interior.

INNER DIMENSIONS

Length = 14.0'
Height = 4.5'
Depth = 20.0'

ENTRY DIMENSIONS

Length = 20.0" Width = 16.0"
(rectangular access)

[The depth is the distance from the entrance to the most distant point.]

SPACE ACCESS/INNER AREA

The center wing box has a single rectangular side access on the forward wall facing the Boiler Room.

RECOMMENDED CLASSIFICATION

Permit-required confined space.

JUSTIFICATION FOR CLASSIFICATION

The center wing box is permit-required due to the following conditions:

- contains or has the potential to contain a hazardous atmosphere (e.g., fuel and its constituents, nitrogen from fuel lines, fire bottles), and
- contains other recognized serious or health hazards (e.g., fuel lines, mechanical hazard from torque tubes).

TASKS PERFORMED WITHIN THE SPACE

Personnel from several work centers can enter the center wing box to perform both general and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following tasks may be performed during scheduled and routine maintenance:

- A general inspection is conducted during every ISO Inspection (every 420 days) for each aircraft. A visual check is conducted on the structural components, fasteners, flight control cables, and torque tubes. No chemicals are used during the inspection. The procedure takes approximately 30 to 60 minutes, and is conducted IAW TO 1C-5A-6WC-5.
- The Sheet Metal shop inspects the internal structure/skin and various internal components during every ISO Inspection (every 420 days). During the inspection, a corrosion preventive compound (MIL-C-85405) is sprayed onto the internal components to prevent water corrosion. The procedure takes approximately 1 hour.

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the center wing box. Hot work, such as grinding, welding or brazing in a permit-required confined space requires a confined space entry permit AND a hot work permit. Both permits must be reviewed and approved in writing by SEG, CEF, and BE prior to conducting any hot work in the space.

POTENTIAL HAZARDS

The following table, *Potential Hazards*, contains various hazards that could be encountered when performing permit-required confined space entries into the center wing box. The systems described in the table (e.g., fire bottles [A-model], fuel lines/manifolds, flight control cables, electrical manifold transmitters [A-model], torque tubes) are closed/contained, and are hazardous if they are intentionally opened or a significant leak occurs. These conditions are unlikely due to personnel training and specific aircraft TOs and OIs that are strictly complied with. The TOs and OIs govern procedures such as lockout/tagout and system checks prior to entering the various areas of the aircraft.

TABLE 7. Potential Hazards (Center Wing Box)

POTENTIAL HAZARDS	
Hazard	Hazard Description
Combustibility	The center wing box has the potential to contain jet fuel and/or jet fuel vapors that are combustible.
Electrical	The A-model C-5 has electrical fuel wing manifold transmitters.
Hazardous Materials Present	The contents of the fire bottles and jet fuel and/or fuel vapors may be present in various cavities of the space. Jet fuel and its constituents (e.g., benzene, toluene, xylene) can be a potential hazard to the entrant by route of inhalation, skin absorption, ingestion, and contact.
Introduction of Hazardous Materials	The corrosion preventive compound used to coat the internal components could potentially include hazardous materials. Only authorized chemicals should be used within the space.
Mechanical	The torque tubes can trap and possibly grind the jammed portion of an entrant.
Oxygen Deficiency	Oxygen deficiency caused by oxygen displacement is a potential hazard due to unfavorable ventilation, fuel vapors, and nitrogen from fuel components. In addition, several operations require the use of solvents, cleaners, and/or adhesives. Depending on the quantity and duration of use, the constituents of the chemicals could displace the oxygen within the space.
Temperature Extremes	Temperature extremes may present a hazard due to one or a combination of several factors such as ambient temperature, radiant heat, local winds, support equipment, and PPE.
Unfavorable Natural Ventilation	Due to the small entry access into the center wing box, there is normally minimal natural ventilation.

RECOMMENDED ENGINEERING/ADMINISTRATIVE CONTROLS

The following engineering and administrative controls should be in place prior to making entries into the center wing box:

- **Lockout/Tagout:** Lockout/tagout procedures must be performed on electrical and mechanical systems prior to entry. Danger tags are placed on the relevant circuit breakers, batteries, and external power. The hydraulic systems are disabled, and pressure limiters are used on the nitrogen system. Restricted areas are established to minimize foot traffic. Pressure limiters monitor and control the nitrogen pressure in the fuel tanks by opening and closing the dewar isolation valves. There are two pressure limiters, one for each set of wing fuel tanks, mounted on the ceiling of the cargo compartment (between the wings). The pressure limiters also have a pull lever used to manually shut off the dewar isolation valves.
- **Ventilation:** Ventilating a confined space before entry is not necessary if atmospheric monitoring results are acceptable. Atmospheric monitoring will be performed prior to entry and continuously thereafter. However, the entry authority can and should use ventilators to maintain acceptable air quality within the space during the entry if necessary.
- **Administrative:** Personnel should minimize the time spent in confined spaces by performing only necessary tasks within the space. Any work that can be conducted outside of the space should not be performed during the entry.

RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE must be assigned based on the atmospheric conditions of the confined space, the physical hazards present, the task being performed, and the hazardous materials being used. Protective equipment that may be used for tasks in this space include:

- coveralls,
- approved footwear,
- disposable nitrile or neoprene gloves,
- cap or head covering, and
- goggles or safety glasses with side shields.

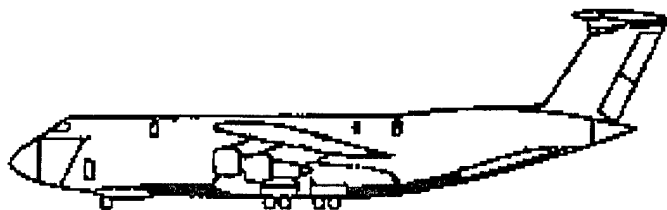
RECOMMENDED EMERGENCY EQUIPMENT

The following emergency equipment is recommended to be available and verified to be in working condition by the designated entry authority prior to authorizing confined space entry into the center wing box:

- intrinsically safe hand radio,
- 150 pound halon fire extinguisher,
- intrinsically safe flashlights, lamps, or lanterns rated for class I, division 1 hazardous atmospheres,
- additional respiratory protection as recommended by BE, and
- rescue webbing harness.

C-5 GALAXY

UNDER-FLOOR AREA – FORWARD & AFT



SPACE DESCRIPTION

The forward and aft under-floor (underbelly) areas are located along the underbelly of the C-5 aircraft, and can be accessed by maintenance personnel from several areas. The forward under-floor area is located in front of the rear wheel wells; and the aft under-floor area is located behind the rear wheel wells. The space contains fire suppression system (FSS) lines, nose gear hydraulic lines, avionics antenna components/wires [400 watts], and bleed air ducts/valves from the auxiliary power unit (APU) used for pressurization (e.g., aircraft, floor heat, and air-conditioning).

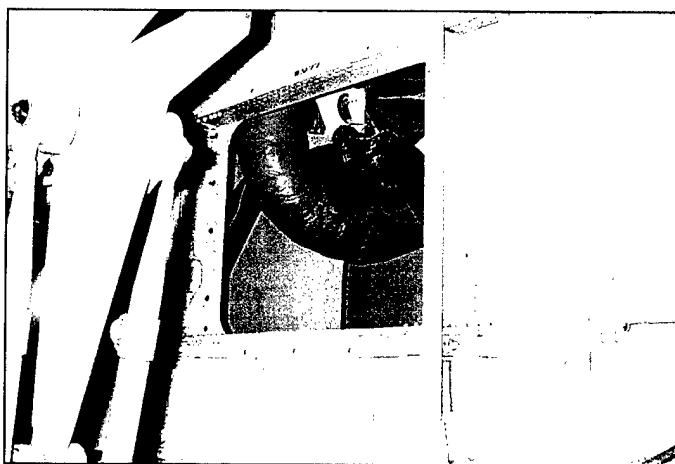


Figure 12. Aft Under-Floor Area: Side entrance.

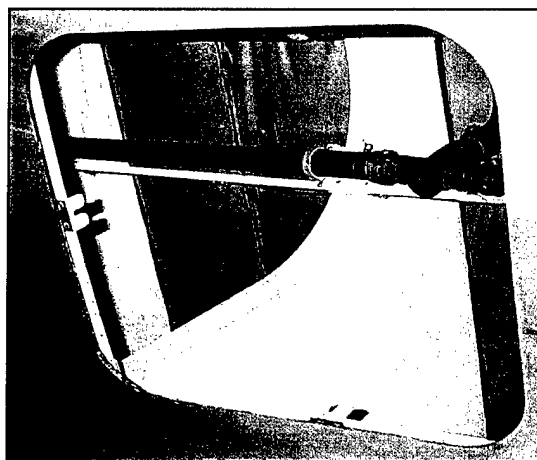


Figure 13. Aft Under-Floor Area: Bottom entrance.

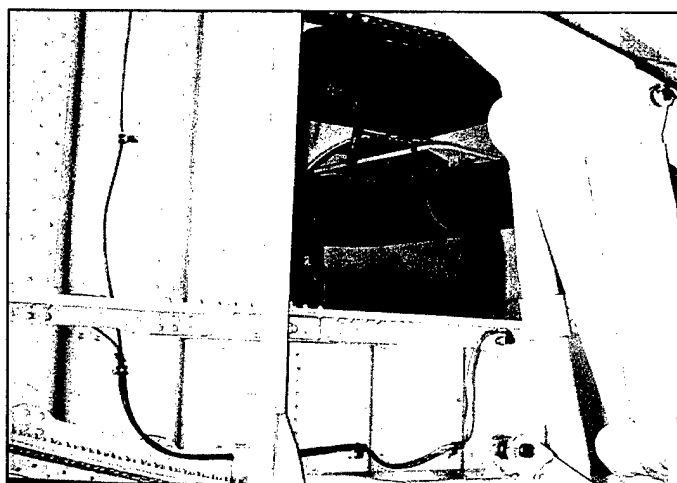


Figure 14. Forward Under-Floor Area: Side entrance.

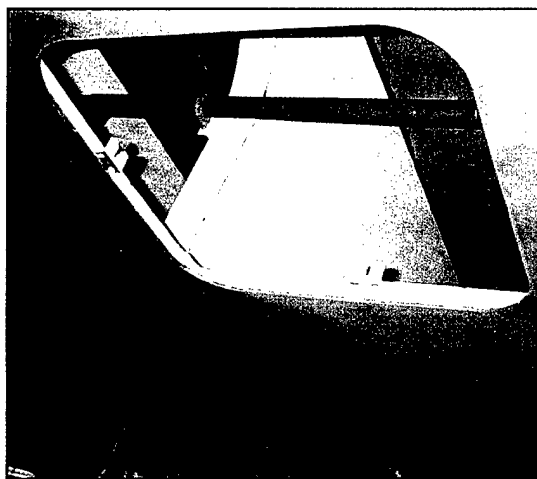


Figure 15. Forward Under-Floor Area: Bottom entrance.

INNER DIMENSIONS

Forward Under-Floor Area

Height (top to bottom) = 3.0' to 4.0'
Width (left to right) = 19.0'
Length (forward to aft) = 42.0'

Aft Under-Floor Area

Height (top to bottom) = 3.0' to 4.0'
Width (left to right) = 19.0'
Length (forward to aft) = 27.0'

ENTRY DIMENSIONS

Forward Under-Floor Area

1. Side: Length = 32.0" Width = 24.0"
2. Bottom: Length = 2.0' Width = 2.0'

Aft Under-Floor Area

1. Side: Length = 31.0" Width = 24.0"
2. Bottom: Length = 25.5" Width = 23.5"
3. Top: Length = 14.0' Width = 2.0'
4. Top: Length = 14.0' Width = 2.0'

SPACE ACCESS/INNER AREA

The forward under-floor area has two rectangular entrances. The side entrance is located at the aft end of the space, near the front of the rear wheel well. The bottom entrance is located on the underbelly of the aircraft, forward to the rear wheel wells. The C-5 B-model has a hatch on the bottom access.

The aft under-floor area has four rectangular entrances. The side entrance is located underneath the aircraft, aft of the rear wheel well. Only the C-5 B-model has a bottom access located on the underbelly of the aircraft. The two top entrances are located in the fuselage on the cargo floor.

RECOMMENDED CLASSIFICATION

Permit-required confined spaces.

JUSTIFICATION FOR CLASSIFICATION

The forward and aft under-floor areas are permit-required due to the following conditions:

- contains or has the potential to contain a hazardous atmosphere (e.g. nitrogen from FSS lines), and
- contains other recognized serious or health hazards (e.g. electrical avionics antenna components/wires [400 watts]), and
- has an internal configuration such that an entrant could be trapped or asphyxiated (e.g. confined area similar to a crawlspace cluttered with support braces/ribs, FSS lines, hydraulic lines, bleed air ducts).

TASKS PERFORMED WITHIN THE SPACE

Personnel from several work centers can enter the forward and aft under-floor areas to perform both general and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following tasks may be performed during scheduled and routine maintenance:

- The Electro-Environmental (ELEN) shop performs component inspections on each aircraft during ISO Inspections (every 420 days). Each inspection takes approximately 2 hours. Visual checks are conducted on the bleed air ducts/valves, continuous thermal-loop sensors (CTSs), electrical connectors/wiring, and heat blankets (devices that collect condensation and drains it through the underbelly of the aircraft). This task is performed under TO 1C-5A-6WC-5, WC 2-061, *Preflight Inspection – Isochronal*.
- The Structural shop inspects the structural components during ISO Inspection (every 420 days). Visual inspection are performed on fittings, stiffeners, bulkhead panels, the underbelly skin, latrine drain tubing, bleed air ducts, etc. No chemicals are used. This task is performed under TO 1C-5A-6WC-5, WC 2-062, *Preflight Inspection – Isochronal*.
- Approximately three heat blankets are replaced during each component inspection. The aft under-floor area has approximately 56 heat blankets. Each heat blanket takes 15 minutes to remove and replace. The process involves the use of Velcro and snaps. Occasionally, an All Purpose General Adhesive is used to bond the Velcro to the fastener.
- Each floor panel within the aft under-floor area is replaced every 3 to 4 years. Removal takes eight hours, and replacement takes eight hours per panel. First, the hardware (e.g., nuts, bolts, screws) is removed and the panel is pried off with screwdrivers. Repair of the panel is conducted in the Structural or similar shop. Before the repaired panel is installed, the old sealant is scrapped off and the new sealant is applied around the perimeter. A Parting Agent is applied to the panel before it is positioned on the aircraft. Lastly, the hardware is replaced. Each panel requires 2 quarts of B½ sealant and a 10-ounce tube of Parting Agent (silicone grease). This task is performed under TOs 1C-5A-2-2, *Air Frame*, and 1C-5A-3, *Structural*.

- Three or four flapper valves are replaced every 420 days. Flapper valves are rubber devices located inside the skin of the aircraft underbelly, and are used to plug drain holes during pressurization. The aft under-floor area contains approximately 30 flapper valves. Before a flapper valve is replaced, the inside of the bilge is wiped with an adhesion promoter (PR147/PR148). Then a sealant is applied (PR1422 GB). This task is performed under TO 1C-5A-2-2, *Air Frame*.
- Troubleshooting the underbelly strobe light occurs every two years for each aircraft. Only the forward under-floor area contains a strobe light. A hand-held volt/ohm multi-meter is used to check the strobe lights. No chemical are used. This task is performed under TO 1C-5A-2-7, *Electrical*.

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the forward and aft under-floor areas. Hot work, such as grinding, welding or brazing in a permit-required confined space requires a confined space entry permit AND a hot work permit. Both permits must be reviewed and approved in writing by SEG, CEF, and BE prior to conducting any hot work in the space.

POTENTIAL HAZARDS

The following table, *Potential Hazards*, contains various hazards that could be encountered when performing permit-required confined space entries into the forward and aft under-floor areas. The systems described in the table (e.g., FSS lines, nose gear hydraulic lines, avionics antenna components/wires [400 watts], bleed air ducts/valves) are closed/contained, and are hazardous if they are intentionally opened or a significant leak occurs. These conditions are unlikely due to personnel training and specific aircraft TOs and OIs that are strictly complied with. The TOs and OIs govern procedures such as lockout/tagout and system checks prior to entering the various areas of the aircraft.

TABLE 8. Potential Hazards (Under Floor Area)

POTENTIAL HAZARDS	
Hazard	Hazard Description
Electrical	There are electrical avionics wires and components in the spaces.
Entrapment	The under-floor areas are extremely long and confined, and contains crossbars/braces, FSS lines, nose gear hydraulic lines, avionics wires, and bleed air ducts throughout the space. The combination of the extensive length, confined area, and restrictive components creates an entrapment hazard for entry personnel due to limited maneuverability and delayed egress.
Hazardous Materials Present	The FSS chemicals may be potential hazards to the entrant by route of inhalation, skin absorption, ingestion, and contact.
Oxygen Deficiency	Oxygen deficiency caused by oxygen displacement is a potential hazard due to unfavorable ventilation, fuel vapors, and nitrogen from fuel and FSS lines/components. In addition, several operations require the use of solvents, cleaners, and/or adhesives. Depending on the quantity and duration of use, the constituents of the chemicals could displace the oxygen within the space.
Stored Energy	There are pressurized hydraulic lines running throughout the space.
Temperature Extremes	Temperature extremes may present a hazard due to one or a combination of factors such as ambient temperature, radiant heat, support equipment, and PPE.
Unfavorable Natural Ventilation	Due to the small entrances and the length of the tunnel, there is minimal natural ventilation.

RECOMMENDED ENGINEERING/ADMINISTRATIVE CONTROLS

The following engineering and administrative controls should be in place prior to making entries into the forward and aft under-floor areas:

- **Ventilation:** Ventilating a confined space before entry is not necessary if atmospheric monitoring results are acceptable. Atmospheric monitoring will be performed prior to entry and continuously thereafter. However, the entry authority can and should use ventilators to maintain acceptable air quality within the space during the entry if necessary.
- **Lockout/Tagout:** Lockout/tagout procedures must be performed on electrical and mechanical systems prior to entry. The FSS valves are deactivated by disconnecting the four circuit breakers from the flight-deck and the cargo compartment. The forward and aft under-floor areas contain electrical avionics antenna wires that can cause bodily harm if mishandled. All electrical systems must be deenergized using lockout/tagout procedures as specified by OSHA Standard 1910.147, *The Control of Hazardous Energy*, and AFI 32-1064, *AFOSH Lockout/Tagout* prior to working on them.

- **Administrative:** Personnel should minimize the time spent in confined spaces by performing only necessary tasks within the space. Any work that can be conducted outside of the space should not be performed during the entry.

RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE must be assigned based on the atmospheric conditions of the confined space, the physical hazards present, the task being performed, and the hazardous materials being used. Protective equipment that may be used for tasks in this space include:

- coveralls,
- approved footwear,
- disposable nitrile or neoprene gloves for sealant operations, and
- goggles or safety glasses with side shields.

RECOMMENDED EMERGENCY EQUIPMENT

The following emergency equipment is recommended to be available and verified to be in working condition by the designated entry authority prior to authorizing confined space entry into the forward and aft under-floor areas:

- intrinsically safe hand radio,
- 150 pound halon fire extinguisher,
- intrinsically safe flashlights, lamps, or lanterns rated for class I, division 1 hazardous atmospheres, and
- additional respiratory protection as recommended by BE.

C-5 GALAXY

FORWARD SPR POD/ACCESS – (LEFT/RIGHT)

Not Shown
(Located Underneath Aircraft)

SPACE DESCRIPTION

The single point refueling (SPR) pod/access is located along the underbelly of the C-5 aircraft. The space can be accessed by maintenance personnel from a single area in front of the rear wheel well area. The SPR pod/access contains fuel refuel pumps/lines [40 psi], power transfer unit (PTU) hydraulic lines [3,000 psi], and PTU electrical wires. The ram air turbine (RAT) compartment is encased inside the left SPR pod/access, although it is isolated from the SPR pod/access area. The RAT provides hydraulic and generator power in case of an in-flight emergency.

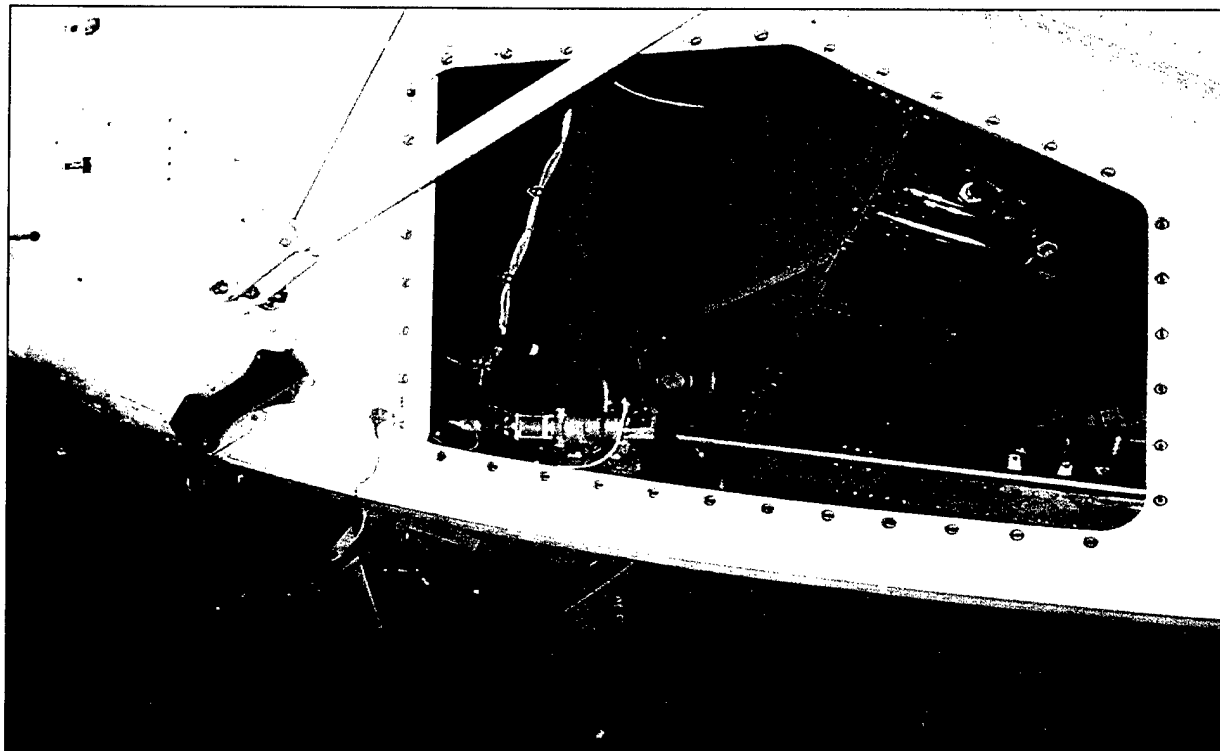


Figure 16. SPR Pod/Access: Side entrance. Shows the RAT panel on bottom left corner, and the RAM casing inside the SPR pod.

INNER DIMENSIONS

Width (left to right) = 11.0'
Height (top to bottom) = 8.0' to 3.0'
Depth (forward to aft) = 17.0'

ENTRY DIMENSIONS

Length = 31.5" Width = 24.0"
(rectangular entrance)

[The depth is the distance from the entrance to the most distant point.]

SPACE ACCESS/INNER AREA

The SPR pod/access has a single side access located on the aft wall of the space, forward to the rear wheel well. The inner area is L-shaped, and tapers from 8' to 3' from the access (aft end) to the forward end.

RECOMMENDED CLASSIFICATION

Permit-required confined space.

JUSTIFICATION FOR CLASSIFICATION

The SPR pod/access is permit-required due to the following conditions:

- contains or has the potential to contain a hazardous atmosphere (e.g. fuel and its constituents), and
- contains other recognized serious or health hazards (e.g. electrical PTU wires, electrical refuel drain pumps), and
- has an internal configuration such that an entrant could be trapped or asphyxiated (e.g. confined area similar to a crawlspace cluttered with crossbars/braces and various lines/wires).

TASKS PERFORMED WITHIN THE SPACE

Personnel from several work centers can enter the SPR pod/access to perform both general and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following tasks may be performed during scheduled and routine maintenance:

- The Fuels shop performs general inspections on each aircraft during ISO Inspections (every 420 days). Each inspection takes approximately 90 minutes. Visual inspections for damage or leaks are conducted on the SPR manifold, fuel drain pumps, access panel, and mounting flanges. No chemicals are used. This task is performed under TO 1C-5A-6WC-5, WC 2-009, *Preflight Inspection – Isochronal*.

- The Fuels shop replaces SPR lines, valves, and pumps during ISO Inspection (every 420 days). Each component is replaced mechanically, and takes approximately 60 minutes. No chemical are used. This task is performed under TO 1C-5A-2-5.
- The grounding point receptacle is replaced every 6 months for each aircraft. The process takes 30 minutes. First, the grounding wire nut is removed to disconnect the grounding wire. Then, the grounding point receptacle is connected and the nut is replaced. No chemical are used. This task is performed under TO 1C-5A-2-7, *Electrical*.
- The hydraulic case drain monitor is replaced every 6 months for each aircraft. Mechanical techniques are used to replace the monitors. No chemicals are used. The process takes 60 minutes and is performed under TO 1C-5A-2-5.

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the SPR pod/access. Hot work, such as grinding, welding or brazing in a permit-required confined space requires a confined space entry permit AND a hot work permit. Both permits must be reviewed and approved in writing by SEG, CEF, and BE prior to conducting any hot work in the space.

POTENTIAL HAZARDS

The following table, *Potential Hazards*, contains various hazards that could be encountered when performing a permit-required confined space entry into the SPR pod/access. The systems described in the table (e.g., refuel lines/pumps, electrical PTU wires, hydraulic PTU lines) are closed/contained, and are hazardous if they are intentionally opened or a significant leak occurs. These conditions are unlikely due to personnel training and specific aircraft TOs and OIs that are strictly complied with. The TOs and OIs govern procedures such as lockout/tagout and system checks prior to entering the various areas of the aircraft.

TABLE 9. Potential Hazards (Forward SPR Pod Access)

POTENTIAL HAZARDS	
Hazard	Hazard Description
Combustibility	The SPR pod/access has the potential to contain jet fuel and/or jet fuel vapors that are combustible.
Electrical	There are electrical PTU and refuel system wires in the space.
Entrapment	The SPR pod/access is an extremely long and confined area that contains crossbars/braces, wires, and hydraulic/fuel lines throughout the space. The combination of the extensive length, confined area, and restrictive components creates an entrapment hazard for entry personnel due to limited maneuverability and delayed egress.
Hazardous Materials Present	Fuel from refuel system and hydraulic fluid may be potential hazards to the entrant by route of inhalation, skin absorption, ingestion, and contact.
Oxygen Deficiency	Oxygen deficiency caused by oxygen displacement is a potential hazard due to unfavorable ventilation, fuel vapors, and nitrogen from fuel components. In addition, several operations require the use of solvents, cleaners, and/or adhesives. Depending on the quantity and duration of use, the constituents of the chemicals could displace the oxygen within the space.
Stored Energy	There are pressurized hydraulic lines [3,000 psi] running throughout the space.
Temperature Extremes	Temperature extremes may present a hazard due to one or a combination of factors such as ambient temperature, radiant heat, local winds, support equipment, and PPE.
Unfavorable Natural Ventilation	Due to the small entry access and length of the space, there is normally minimal natural ventilation.

RECOMMENDED ENGINEERING/ADMINISTRATIVE CONTROLS

The following engineering and administrative controls should be in place prior to making an entry into the SPR pod/access:

- **Ventilation:** Ventilating a confined space before entry is not necessary if atmospheric monitoring results are acceptable. Atmospheric monitoring will be performed prior to entry and continuously thereafter. However, the entry authority can and should use ventilators to maintain acceptable air quality within the space during the entry if necessary.
- **Lockout/Tagout:** Lockout/tagout procedures must be performed on electrical and mechanical systems prior to entry. The FSS valves are deactivated by disconnecting the four circuit breakers from the flight-deck and the cargo compartment. The SPR pod/access contains PTU and refuel system electrical wires that can cause bodily harm if mishandled. All electrical systems must be deenergized using lockout/tagout procedures as specified by OSHA Standard

1910.147, *The Control of Hazardous Energy*, and AFI 32-1064, *AFOSH Lockout/Tagout* prior to working on them.

- **Administrative:** Personnel should minimize the time spent in confined spaces by performing only necessary tasks within the space. Any work that can be conducted outside of the space should not be performed during the entry.

RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE must be assigned based on the atmospheric conditions of the confined space, the physical hazards present, the task being performed, and the hazardous materials being used. Protective equipment that may be used for tasks in this space include:

- coveralls,
- respiratory protection,
- approved footwear,
- disposable or neoprene gloves,
- cap or head covering, and
- goggles or safety glasses with side shields.

RECOMMENDED EMERGENCY EQUIPMENT

The following emergency equipment is recommended to be available and verified to be in working condition by the designated entry authority prior to authorizing entries into the SPR pod/access:

- intrinsically safe hand radio,
- 150 pound halon fire extinguisher,
- intrinsically safe flashlights, lamps, or lanterns rated for class I, division 1 hazardous atmospheres, and
- additional respiratory protection as recommended by BE.

C-5 GALAXY

AFT MAIN LANDING GEAR POD – (LEFT/RIGHT)

Not Shown
(Located Underneath Aircraft)

SPACE DESCRIPTION

The aft main landing gear pod is located along the underbelly of the C-5 aircraft. The space can be accessed by maintenance personnel from a single entrance behind the rear wheel well area. The main landing gear pod contains power source hydraulic lines (3,000 psi), antenna wires (400 watts maximum), and bleed air ducts. The right main landing gear pod contains a single fire suppression system (FSS) line in addition to the systems listed above.

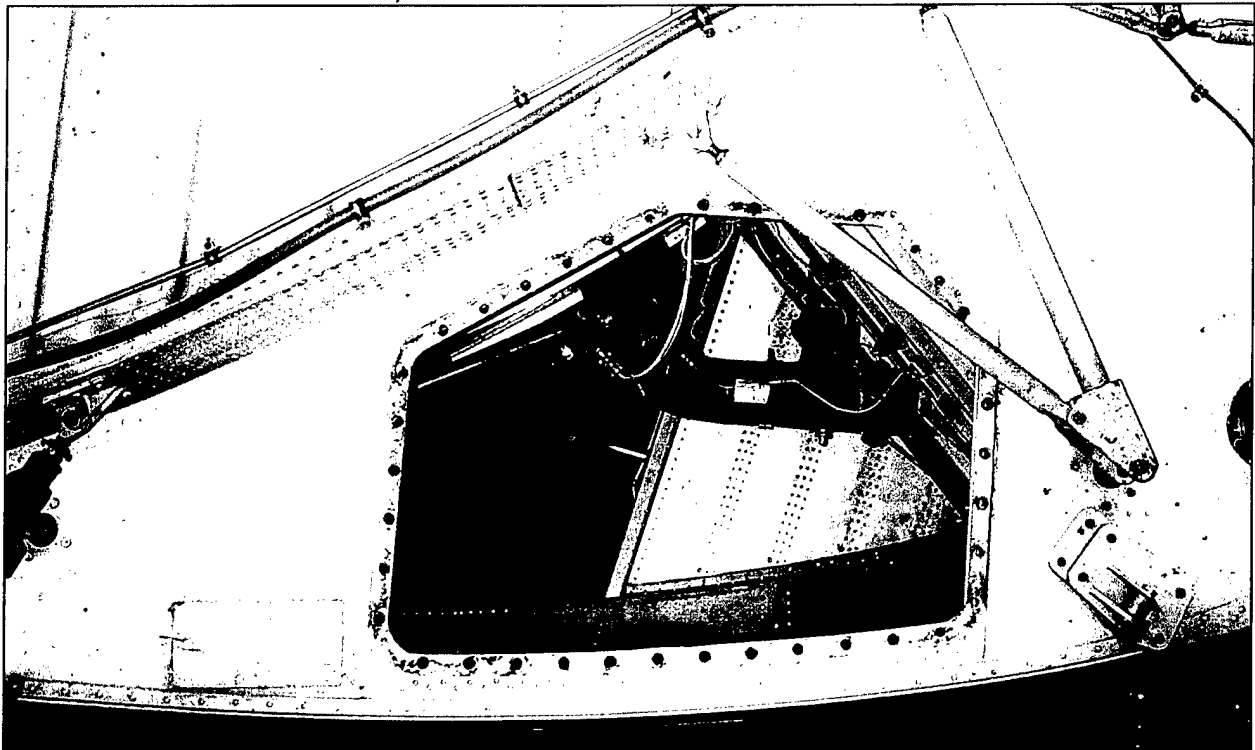


Figure 17. Aft Main Landing Gear Pod: Side entrance.

INNER DIMENSIONS

Width (left to right) = 11.0'
Height (top to bottom) = 8.0' to 3.0'
Depth (forward to aft) = 17.0'

ENTRY DIMENSIONS

Length = 31.5" Width = 24.0"
(rectangular entrance)

[The depth is the distance from the entrance to the most distant point.]

SPACE ACCESS/INNER AREA

The main landing gear pod has a single side access located on the front wall of the space, along the aft end of the rear wheel well. The inner area is L-shaped, and tapers from 8' to 3' from the access (forward end) to the aft end.

RECOMMENDED CLASSIFICATION

Nonpermit-required confined space.

JUSTIFICATION FOR CLASSIFICATION

The space contains a variety of closed/contained systems (e.g., hydraulic lines, antenna wires) that are not CREDIBLE potential hazards and therefore is not a permit-required confined space. The systems are hazardous if they are intentionally opened or a significant leak occurs. These conditions are unlikely due to personnel training and specific aircraft TOs and OIs that personnel are strictly required to comply with. The TOs and OIs govern procedures such as lockout/tagout and system checks prior to entering the various areas of the aircraft.

TASKS PERFORMED WITHIN THE SPACE

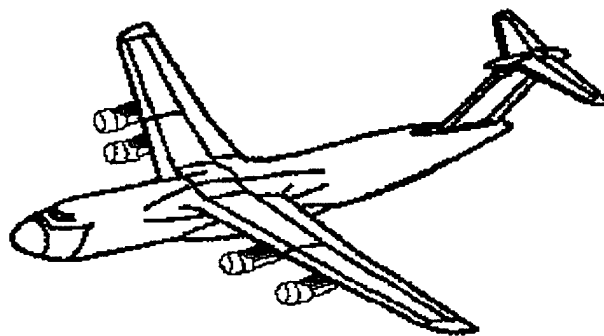
Personnel from several work centers can enter the main landing gear pod to perform both general and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following tasks may be performed during scheduled and routine maintenance:

- General inspections are conducted on each aircraft during ISO Inspections (every 420 days). Each inspection takes approximately 30 minutes. Visual checks for damage or leaks are conducted on the hydraulic lines, drain lines, bleed air ducts, airframe, support braces/ribs, and hardware (e.g., fittings, clamps, screws, bolts). No chemicals are used. This task is performed under TO 1C-5A-6WC-5, WC 2-009.
- Component replacements are performed on each aircraft during ISO Inspections (every 420 days). Clamps on hydraulic lines, and the grommets on the FSS fire loop are mechanically replaced in a couple of minutes. No chemical are used. This task is performed under TO 1C-5A-2-3, *Hydraulic*.

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the main landing gear pod.

C-5 GALAXY

FORWARD PYLON AREA – (LEADING EDGE)



SPACE DESCRIPTION

Each engine is attached to the wing by a pylon. The C-5 has four pylons, two on each wing. There is an inboard and an outboard pylon on each wing. Each pylon is divided into two areas: the forward pylon (leading edge) area and the aft pylon (fire bottle) area. The forward pylon area contains fuel lines, hydraulic lines [3,000 psi], fire suppression system (FSS) lines, bleed air valve ducts, miscellaneous electrical wires, generator leads, and throttle cables.

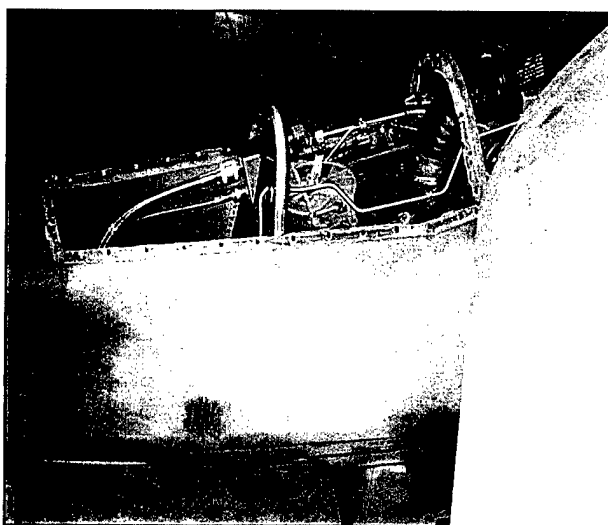


Figure 18. Forward Pylon (Leading Edge): Side view.

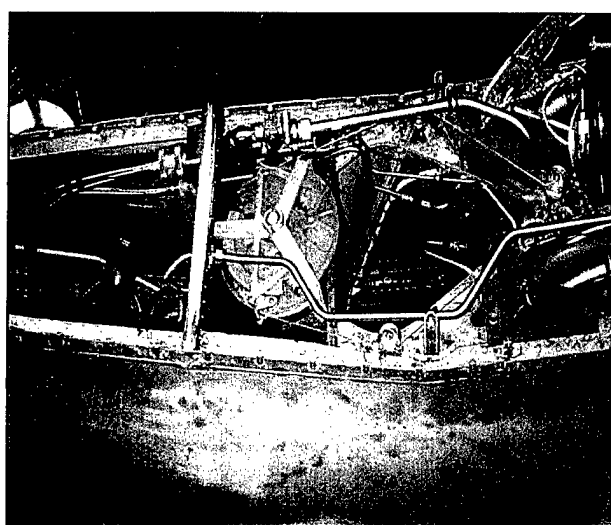


Figure 19. Forward Pylon (Leading Edge): Top view.

INNER DIMENSIONS

Width (left to right) = 22.0"
Length (forward to aft) = 13.5'
Depth (top to bottom) = 4.0'

ENTRY DIMENSIONS

Length = 17.0" Width = 14.0"
(rectangular entrance)

[The depth is the distance from the entrance to the most distant point.]

SPACE ACCESS/INNER AREA

The forward pylon area has a single access located on top of the space. Before the space can be entered, the bleed air "Y" duct and fire access door must be removed.

RECOMMENDED CLASSIFICATION

Permit-required confined space.

JUSTIFICATION FOR CLASSIFICATION

The forward pylon area is permit-required due to the following conditions:

- contains or has the potential to contain a hazardous atmosphere (e.g. nitrogen from FSS and fuel lines, fuel and its constituents from the fuel lines), and
- contains other recognized serious or health hazards (e.g. electrical wires), and
- has an internal configuration such that an entrant could be trapped or asphyxiated (e.g. confined area cluttered with structural beams and various components).

TASKS PERFORMED WITHIN THE SPACE

Personnel from several work centers can enter the forward pylon area to perform both general and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following tasks may be performed during scheduled and routine maintenance:

- The air/oil separator boots are replaced once every ISO Inspections (every 420 days). Each boot takes approximately 60 minutes to replace using mechanical techniques. Two clamps are unfastened, the old boot is replaced with a new one, and then the two clamps are refastened. No chemicals are used. This task is performed under TO 1C-5A-2-4, *Power Plant C-5A & C-5B*.

- Hydraulic line replacements are performed twice during ISO Inspections (every 420 days) per aircraft. The process takes 3 hours and is conducted using mechanical techniques. No chemicals are used. The couplings are disconnected after the clamps are unfastened and the hydraulic line is capped/plugged. The damaged hydraulic line is removed and the new one is installed. Then the couplings and clamps are reconnected. This task is performed under TOs 1C-5A-2-3, *Hydraulic* and 1C-5A-2-4.
- Electrical wires are repaired or replaced in each pylon every ISO Inspection (every 420 days). Once the damaged wires are identified, the procedure takes 2 hours. A new wire is spliced in place of the old one, or the old wire is reconnected if there is enough slack. Electrical contact cleaner is sprayed on the wires prior to wire splicing/repair. Approximately 1 ounce is used per wire replacement/repair. This task is performed under TO 1C-5A-2-11, *Aircraft Wiring Diagrams*.
- An engine is changed approximately once a month on each aircraft. The entire process takes 8 hours. However, entries into the forward pylon areas are conducted only when the plumbing (e.g., hydraulic and fuel lines) and hardware (e.g., mounting bolts, screws, bolts, nuts) is disconnected/removed before the damaged engine is removed, then again when the various components need to be reconnected. No chemical are used. This task is performed under TO 1C-5A-2-4.
- General inspections are conducted on each aircraft during ISO Inspections (every 420 days). Each inspection takes approximately 4 hours. Visual inspections for damage or leaks are conducted on the hydraulic lines, fuel lines, throttle cables, airframe, support braces/ribs, and hardware (e.g., fittings, clamps, screws, bolts). No chemicals are used. This task is performed under TO 1C-5A-6WC-5, WCs 3-013, 3-015, 3-017, 3-019, 3-020, 3-022, *Preflight Inspection – Isochronal*.

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the forward pylon area. Hot work, such as grinding, welding or brazing in a permit-required confined space requires a confined space entry permit AND a hot work permit. Both permits must be reviewed and approved in writing by SEG, CEF, and BE prior to conducting any hot work in the space.

POTENTIAL HAZARDS

The following table, *Potential Hazards*, contains various hazards that could be encountered when performing a permit-required confined space entry into the forward pylon area. The systems described in the table (e.g., fuel lines, FSS lines, hydraulic lines [3,000 psi], electrical wires, generator leads, bleed air valve ducts, throttle cables) are closed/contained, and are hazardous if they are intentionally opened or a significant leak occurs. These conditions are unlikely due to personnel training and specific aircraft TOs and OIs that are strictly complied with. The TOs and OIs govern procedures such as lockout/tagout and system checks prior to entering the various areas of the aircraft.

TABLE 10. Potential Hazards (Forward Pylon Area)

POTENTIAL HAZARDS	
Hazard	Hazard Description
Combustibility	The forward pylon areas have the potential to contain jet fuel and/or jet fuel vapors that are combustible.
Electrical	There are electrical wires throughout the space.
Entrapment	The forward pylon area is a confined area that contains crossbars/braces, FSS lined, fuel lines, electrical wires, bleed air ducts, and hydraulic lines throughout the space. The combination of the confined area and restrictive components creates an entrapment hazard for entry personnel due to limited maneuverability and delayed egress.
Hazardous Materials Present	FSS contents and hydraulic fluid may be potential hazards to the entrant by route of inhalation, skin absorption, ingestion, and contact.
Oxygen Deficiency	Oxygen deficiency caused by oxygen displacement is a potential hazard due to unfavorable ventilation, fuel vapors, and nitrogen from FSS components. In addition, several operations require the use of solvents, cleaners, and/or adhesives. Depending on the quantity and duration of use, the constituents of the chemicals could displace the oxygen within the space.
Stored Energy	There are pressurized hydraulic lines [3,000 psi] running throughout the space.
Temperature Extremes	Temperature extremes may present a hazard due to one or a combination of factors such as ambient temperature, radiant heat, local winds, support equipment, and PPE.
Unfavorable Natural Ventilation	Due to the small entry access and length of the space, there is normally minimal natural ventilation.

RECOMMENDED ENGINEERING/ADMINISTRATIVE CONTROLS

The following engineering and administrative controls should be in place prior to making an entry into the forward pylon area:

- **Ventilation:** Ventilating a confined space before entry is not necessary if atmospheric monitoring results are acceptable. Atmospheric monitoring will be performed prior to entry and continuously thereafter. However, the entry authority can and should use ventilators to maintain acceptable air quality within the space during the entry if necessary.
- **Lockout/Tagout:** Lockout/tagout procedures must be performed on electrical and mechanical systems prior to entry. The FSS valves are deactivated by disconnecting the four circuit breakers from the flight-deck and the cargo compartment. The forward pylon area contains various wires that can cause bodily harm if mishandled. All electrical systems must be deenergized using lockout/tagout procedures as specified by OSHA Standard 1910.147, *The Control of Hazardous Energy*, and AFI 32-1064, *AFOSH Lockout/Tagout* prior to working on them.
- **Administrative:** Personnel should minimize the time spent in confined spaces by performing only necessary tasks within the space. Any work that can be conducted outside of the space should not be performed during the entry.

RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE must be assigned based on the atmospheric conditions of the confined space, the physical hazards present, the task being performed, and the hazardous materials being used. Protective equipment that may be used for tasks in this space include:

- coveralls,
- approved footwear,
- disposable nitrile or neoprene gloves,
- cap or head covering, and
- goggles or safety glasses with side shields.

RECOMMENDED EMERGENCY EQUIPMENT

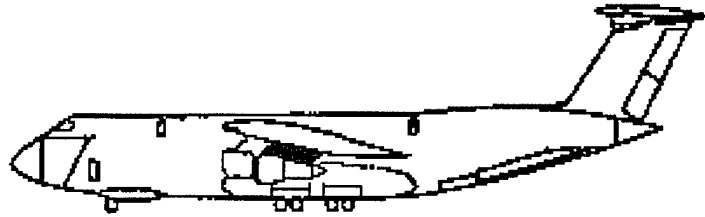
The following emergency equipment is recommended to be available and verified to be in working condition by the designated entry authority prior to authorizing entries into the forward pylon area:

- intrinsically safe hand radio,
- 150 pound halon fire extinguisher,

- intrinsically safe flashlights, lamps, or lanterns rated for class I, division 1 hazardous atmospheres, and
- additional respiratory protection as recommended by BE.

C-5 GALAXY

AFT PYLON AREA – (FIRE BOTTLE)



SPACE DESCRIPTION

Each engine is attached to the wing by a pylon. The C-5 has four pylons, two on each wing. There is an inboard and an outboard pylon on each wing. Each pylon is divided into two areas: the forward pylon (leading edge) area and the aft pylon (fire bottles) area. The aft pylon areas contain electrical wires, hot air vent tubes (4" diameter), and a fire bottle. The fire bottles are part of the fire suppression system (FSS) and are located in the inboard aft pylon areas. The fire bottles contain a freon agent called Bromo-trifluoro-methane (CF_3Br) which propels out of the bottles by explosive squibs.

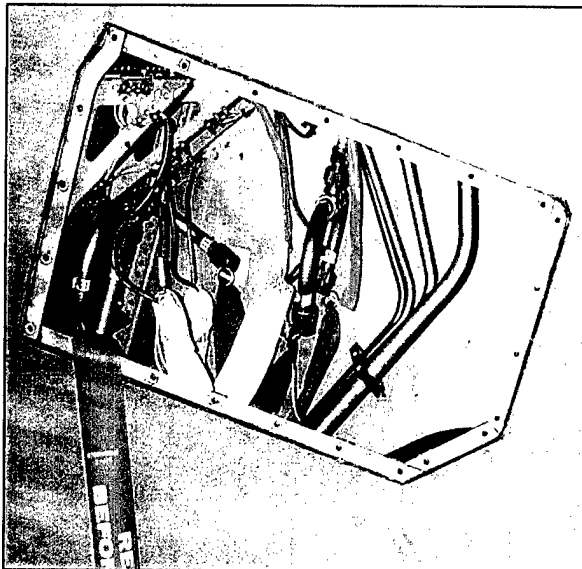


Figure 20. Aft Pylon Area: Access. Fire Bottle removed.

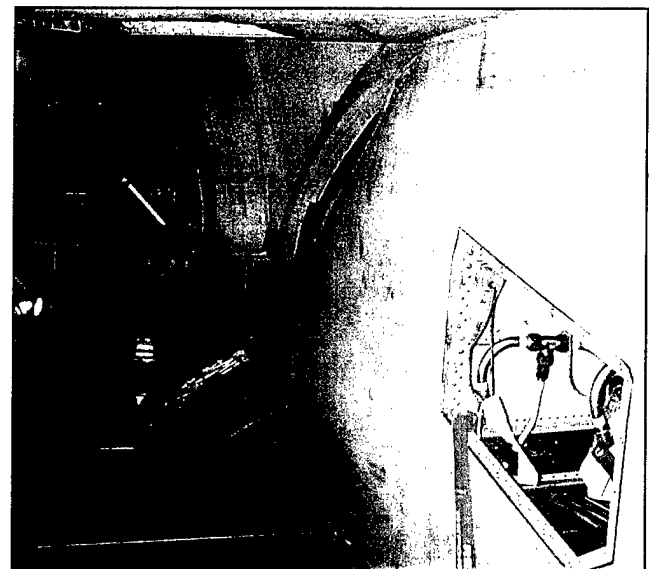


Figure 21. Aft Pylon Area: Facing front of pylon (engine).

INNER DIMENSIONS

Height (top to bottom) = 5.0' to 0.5'
Length (forward to aft) = 18.0'
Depth (left to right) = 20.0'

ENTRY DIMENSIONS

Length = 29.0" Width = 16.0"
(irregular shaped entrance)

[The depth is the distance from the entrance to the most distant point.]

SPACE ACCESS/INNER AREA

The aft pylon area has a single access located on the side of the space. Before the space can be entered, the fire bottle must be removed.

RECOMMENDED CLASSIFICATION

Nonpermit-required confined space.

JUSTIFICATION FOR CLASSIFICATION

The space contains a variety of closed/contained systems (e.g., FSS fire bottles, electrical wires, hot air vent tubes) that are not CREDIBLE potential hazards and therefore is not a permit-required confined space. The systems are hazardous if they are intentionally opened or a significant leak occurs. These conditions are unlikely due to personnel training and specific aircraft TOs and OIs that are strictly complied with. The TOs and OIs govern procedures such as lockout/tagout and system checks prior to entering the various areas of the aircraft.

TASKS PERFORMED WITHIN THE SPACE

Personnel from several work centers can enter the aft pylon area to perform both general and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following tasks may be performed during scheduled and routine maintenance:

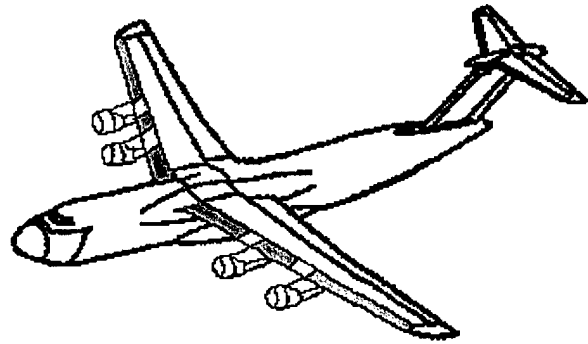
- General inspections are conducted on each aircraft during ISO Inspections (every 420 days). Each inspection takes approximately 60 minutes. Visual checks for damage or leaks are conducted on the electrical wires/connectors, support braces/ribs, plumbing, and hardware (e.g., mounts, fittings, clamps, screws, bolts). No chemicals are used. This task is performed under TO 1C-5A-6WC-5, WC 3-016, *Preflight Inspection – Isochronal*.

- The fire bottles are removed during ISO Inspections (every 420 days). The process takes 30 minutes. First, the electrical input to the squib (propelling agent) is disconnected. After all of the hardware (e.g., tubing, mounts, nuts, bolts) and the fire bottle are removed, a protective cap is placed over the squib of the fire bottle. No chemicals are used. This task is performed under TO 1C-5A-2-13, *Environmental & Oxygen Systems*.
- Hardware replacement is conducted on each aircraft during ISO Inspections (every 420 days). Loose or damaged hardware (e.g., screws, bolts, fasteners) are mechanically replaced in minutes. No chemical are used. This task is performed under TO 1C-5A-1-1A-8, *Communication & Navigation*.

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the aft pylon area.

C-5 GALAXY

WING LEADING EDGE – (LEFT/RIGHT)



SPACE DESCRIPTION

The wing leading edge is the area where the slat cavities are located. The slats are secondary flight control assemblies (7 on each wing). The entire wing is divided into three basic sections: the wing leading edge (forward), the fuel tanks (middle), and the flap wells (aft/trailing edge). The wing leading edge is divided into two sections: inboard and outboard. The inboard wing leading edge consists of the area from the shoulder of the wing (fuselage end) to the inboard pylon/engine, excluding the signal amplifier remote (SAR) space. The outboard wing leading edge is the area from the inboard pylon/engine to the outboard pylon/engine. Each wing leading edge contains fuel lines, fuel shutoff valves/cables, throttle control cables, hydraulic lines, fire suppression system (FSS) lines, various electrical wires, bleed air ducts (110 psi maximum when engines are on), torque tubes for slat driven mount beam, and jack-screws. The outboard wing leading edge has half as many components as the inboard wing leading edge because the outboard wing leading edge has components from only one engine.

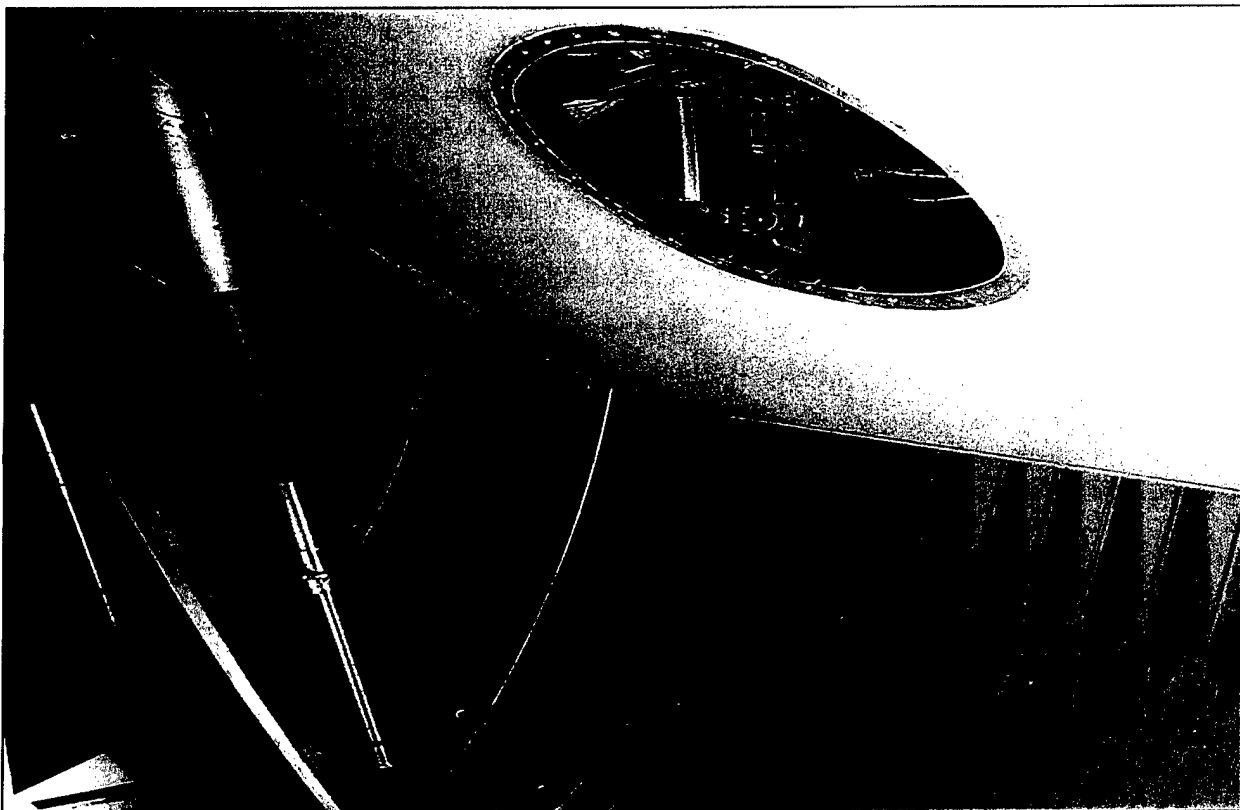


Figure 22. Wing Leading Edge: Two of the three bottom entrances of the inboard wing leading edge.

INNER DIMENSIONS

Inboard Wing Leading Edge

Width (forward to aft) = 43.5"
Length (inboard to outboard) = 22.0'
Depth (top to bottom) = 32.0"

Outboard Wing Leading Edge

Width (forward to aft) = 34.0"
Length (inboard to outboard) = 19.0'
Depth (top to bottom) = 25.0"

[The depth is the distance from the entrance to the most distant point.]

ENTRY DIMENSIONS

1. Length = 25.0" Width = 16.0"
 2. Length = 25.0" Width = 16.0"
 3. Length = 25.0" Width = 16.0"
- (all three entrances are oval)

SPACE ACCESS/INNER AREA

Each wing leading edge area has three evenly spaced bottom entrances known as "watermelon" access panels. The inner shape is irregular (slightly triangular).

RECOMMENDED CLASSIFICATION

Permit-required confined space.

JUSTIFICATION FOR CLASSIFICATION

The wing leading edge is permit-required due to the following conditions:

- contains or has the potential to contain a hazardous atmosphere (e.g. nitrogen from FSS and fuel lines, fuel and its constituents from the fuel lines), and
- contains other recognized serious or health hazards (e.g. mechanical hazard from torque tubes), and
- has an internal configuration such that an entrant could be trapped or asphyxiated (e.g. confined area cluttered with structural beams and various components).

TASKS PERFORMED WITHIN THE SPACE

Personnel from several work centers can enter the wing leading edge to perform both general and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following tasks may be performed during scheduled and routine maintenance:

- General inspections are conducted for each aircraft during ISO Inspections (every 420 days). Each inspection takes approximately 8 hours. Visual checks for damage or leaks are conducted on the fuel shutoff cables, throttle cables, forward flange airframe, and hardware (e.g., mounts, fittings, clamps, screws, bolts). The torque tubes are manually turned to check gears and serviceability (loose, frayed, or damaged). No chemicals are used. This task is performed under TO 1C-5A-6WC-5.
- The fuel shutoff cables are replaced 1 or 2 times a year for each aircraft. Each cable takes 4 hours to replace. The fuel shutoff cables and the throttle cables are never replaced at the same time due to cable similarities and potential confusion. The total length of the cable is approximately 500' and passes through the following locations: flight deck, cargo, wing, pylon, and fuel control. However, the cables are replaced one section at a time. First, cable blocks are placed at each end of the damaged cable section before the turnbuckles (devices used to attach cable sections) are removed. The damaged cable is pulled out. The cable path is visually checked when the new cable is passed through. The turnbuckles are partially connected before the cable blocks are removed in order to measure the cable tension with a hand-held meter. Once the cable tension is acceptable, the turnbuckles are locked in place. No chemicals are used. This task is performed under TO 1C-5A-2-5, *Fuel Systems*.
- The throttle control cables are replaced 1 or 2 times a year for each aircraft. Each cable takes 4 hours to replace. The throttle control cables and the fuel shutoff cables are never replaced at the same time due to cable similarities and potential confusion. The total length of the cable is approximately 500' and passes through the following locations: flight deck, cargo, wing, pylon, and fuel control. However, the cables are replaced one section at a time. First, cable blocks are placed at each end of the damaged cable section before the turnbuckles (devices used to attach cable sections) are removed. The damaged cable is pulled out. The cable path is visually checked when the new cable is passed through. The turnbuckles are partially connected before the cable blocks are removed in order to measure the cable tension with a hand-held meter.

Once the cable tension is acceptable, the turnbuckles are locked in place. No chemicals are used. This task is performed under TO 1C-5A-2-5, *Fuel Systems*.

- Approximately three airframe support braces/bracket are replaced during ISO Inspections (every 420 days) for each aircraft. Clamps and brackets attach various lines to the support braces. When a support brace or bracket is replaced, first the hardware (e.g., bolts, screws, bounding wires, clamps) is removed. The damaged airframe support part is repaired at the Structural or similar shop according to the type of damage. The repaired or new part is installed, and the hardware is replaced. No chemicals are used. This task is performed under TO 1C-5A-2-2, *Airframe*, Paragraph 7-7, *Maintenance Procedures*.

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the wing leading edge. Hot work, such as grinding, welding or brazing in a permit-required confined space requires a confined space entry permit AND a hot work permit. Both permits must be reviewed and approved in writing by SEG, CEF, and BE prior to conducting any hot work in the space.

POTENTIAL HAZARDS

The following table, *Potential Hazards*, contains various hazards that could be encountered when performing a permit-required confined space entry into the wing leading edge. The systems described in the table (e.g., fuel lines/valves, FSS lines, hydraulic lines [3,000 psi], electrical wires, bleed air ducts, fuel shutoff/throttle cables) are closed/contained, and are hazardous if they are intentionally opened or a significant leak occurs. These conditions are unlikely due to personnel training and specific aircraft TOs and OIs that are strictly complied with. The TOs and OIs govern procedures such as lockout/tagout and system checks prior to entering the various areas of the aircraft.

TABLE 11. Potential Hazards (Wing Leading Edge)

POTENTIAL HAZARDS	
Hazard	Hazard Description
Combustibility	The wing leading edge has the potential to contain jet fuel and/or jet fuel vapors that are combustible.
Electrical	There are electrical wires throughout the space.
Entrapment	The wing leading edge is a confined area that contains crossbars/braces, FSS lined, fuel lines, electrical wires, bleed air ducts, and hydraulic lines throughout the space. The combination of the confined area and restrictive components creates an entrapment hazard for entry personnel due to limited maneuverability and delayed egress.
Hazardous Materials Present	FSS contents, fuel, and hydraulic fluid may be potential hazards to the entrant by route of inhalation, skin absorption, ingestion, and contact.
Oxygen Deficiency	Oxygen deficiency caused by oxygen displacement is a potential hazard due to unfavorable ventilation, fuel vapors, and nitrogen from fuel and FSS components. In addition, several operations require the use of solvents, cleaners, and/or adhesives. Depending on the quantity and duration of use, the constituents of the chemicals could displace the oxygen within the space.
Stored Energy	There are pressurized hydraulic lines [3,000 psi] running throughout the space.
Temperature Extremes	Temperature extremes may present a hazard due to one or a combination of factors such as ambient temperature, radiant heat, local winds, support equipment, and PPE.
Unfavorable Natural Ventilation	Due to the small entry access and length of the space, there is normally minimal natural ventilation.

RECOMMENDED ENGINEERING/ADMINISTRATIVE CONTROLS

The following engineering and administrative controls should be in place prior to making entries into the wing leading edge:

- **Ventilation:** Ventilating a confined space before entry is not necessary if atmospheric monitoring results are acceptable. Atmospheric monitoring will be performed prior to entry and continuously thereafter. However, the entry authority can and should use ventilators to maintain acceptable air quality within the space during the entry if necessary.
- **Lockout/Tagout:** Lockout/tagout procedures must be performed on electrical and mechanical systems prior to entry. The FSS valves are deactivated by disconnecting the four circuit breakers from the flight-deck and the cargo compartment. The wing leading edge contains various wires that can cause bodily harm if mishandled. All electrical systems must be deenergized using lockout/tagout procedures as specified by OSHA Standard 1910.147, *The Control of Hazardous Energy*, and AFI 32-1064, *AFOSH Lockout/Tagout* prior to working on them.

- **Administrative:** Personnel should minimize the time spent in confined spaces by performing only necessary tasks within the space. Any work that can be conducted outside of the space should not be performed during the entry.

RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE must be assigned based on the atmospheric conditions of the confined space, the physical hazards present, the task being performed, and the hazardous materials being used. Protective equipment that may be used for tasks in this space include:

- coveralls,
- approved footwear,
- disposable nitrile or neoprene gloves,
- cap or head covering, and
- goggles or safety glasses with side shields.

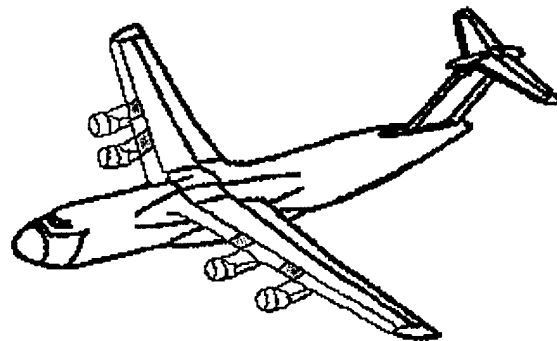
RECOMMENDED EMERGENCY EQUIPMENT

The following emergency equipment is recommended to be available and verified to be in working condition by the designated entry authority prior to authorizing entries into the wing leading edge:

- intrinsically safe hand radio,
- 150 pound halon fire extinguisher,
- intrinsically safe flashlights, lamps, or lanterns rated for class I, division 1 hazardous atmospheres, and
- additional respiratory protection as recommended by BE.

C-5 GALAXY

SAR LEADING EDGE PANEL – (LEFT/RIGHT)



SPACE DESCRIPTION

The signal amplifier remote (SAR) leading edge panel is an extension of the wing leading edge. The entire wing is divided into three basic sections: the wing leading edge (forward), the fuel tanks (middle), and the flap wells (aft/trailing edge). Each wing has two SAR leading edge panels (inboard and outboard) located inboard to each engine. Each wing leading edge contains fuel lines, fuel shutoff valves/cables, throttle control cables, hydraulic lines, fire suppression system (FSS) lines, and various electrical wires. The outboard SAR leading edge has half as many components as the inboard wing leading edge because the outboard wing leading edge has components from only one engine.

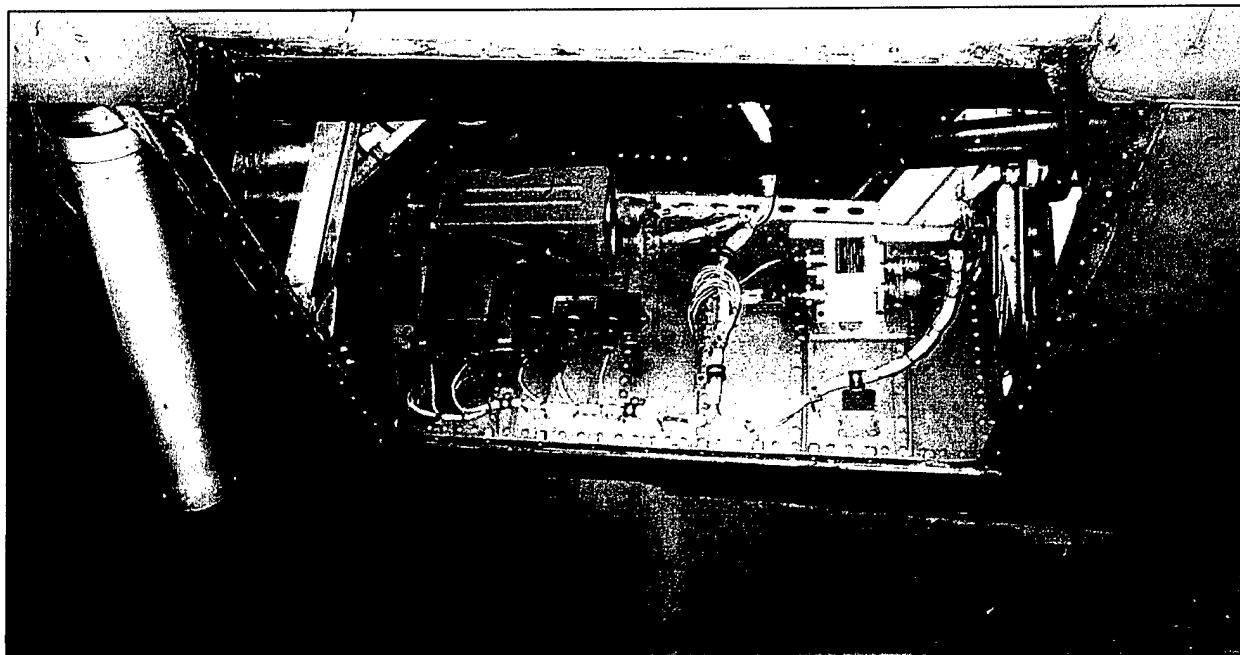


Figure 23. SAR Leading Edge Panel: Bottom access and interior.

INNER DIMENSIONS

Length (forward to aft) = 31.0"
Width (left to right) = 28.0"
Depth (top to bottom) = 26.5"

ENTRY DIMENSIONS

Length = 31.0" Width = 28.0"
(rectangular entrance)

[The depth is the distance from the entrance to the most distant point.]

SPACE ACCESS/INNER AREA

Each SAR leading edge panel area has a single bottom entrance. The inboard and outboard SAR leading edge panels have the same entry and inner dimensions.

RECOMMENDED CLASSIFICATION

Not a confined space.

JUSTIFICATION FOR CLASSIFICATION

The SAR leading edge area is not large enough to bodily enter, and does not have a limited means of entry or egress. Therefore, it is not a confined space and not regulated IAW the AFOSH and OSHA confined space standards.

TASKS PERFORMED WITHIN THE SPACE

Personnel from several work centers can enter the SAR leading edge panel to perform both general and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following tasks may be performed during scheduled and routine maintenance:

- General inspections are conducted on each aircraft during ISO Inspections (every 420 days). Visual checks for damage or leaks are conducted on the fuel shutoff cables, throttle cables, forward flange airframe, and hardware (e.g., mounts, fittings, clamps, screws, bolts). No chemicals are used. This task is performed under TO 1C-5A-6WC-5.
- The fuel shutoff cables are replaced 1 or 2 times a year for each aircraft. Each cable takes 4 hours to replace. The fuel shutoff cables and the throttle cables are never replaced at the same time due to cable similarities and potential confusion. The total length of the cable is approximately 500' and passes from the following locations: flight deck, cargo, wing, pylon, fuel control. However, the cables are replaced one section at a time. First, cable blocks are placed at each end of the damaged cable section before the turnbuckles (devices used to attach cable sections) are removed. The damaged cable is pulled out. The cable path is visually checked when the new cable is feed through. The turnbuckles are partially connected before the cable blocks are removed in order to measure the

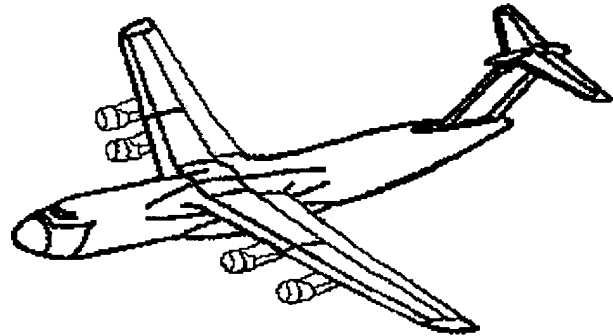
cable tension with a hand-held meter. Once the cable tension is acceptable, the turnbuckles are locked in place. No chemicals are used. This task is performed under TO 1C-5A-2-5, *Fuel Systems*.

- The throttle control cables are replaced 1 or 2 times a year for each aircraft. Each cable takes 4 hours to replace. The throttle control cables and the fuel shutoff cables are never replaced at the same time due to cable similarities and potential confusion. The total length of the cable is approximately 500' and passes from the following locations: flight deck, cargo, wing, pylon, and fuel control. However, the cables are replaced one section at a time. First, cable blocks are placed at each end of the damaged cable section before the turnbuckles (devices used to attach cable sections) are removed. The damaged cable is pulled out. The cable path is visually checked when the new cable is feed through. The turnbuckles are partially connected before the cable blocks are removed in order to measure the cable tension with a hand-held meter. Once the cable tension is acceptable, the turnbuckles are locked in place. No chemicals are used. This task is performed under TO 1C-5A-2-5, *Fuel Systems*.
- Airframe support braces/bracket are replaced during ISO Inspections (every 420 days) for each aircraft. Clamps and brackets attach various lines to the support braces. When a support brace or bracket is replaced, first the hardware (e.g., bolts, screws, bounding wires, clamps) is removed. The damaged airframe support part is repaired at the appropriate shop according to the type of damage. The repaired or new part is installed, and the hardware is replaced. No chemicals are used. This task is performed under TO 1C-5A-2-2, *Airframe*, Paragraph 7-7, *Maintenance Procedures*.

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the SAR leading edge panel.

C-5 GALAXY

FLAP WELLS – (LEFT/RIGHT)



SPACE DESCRIPTION

The flap wells contain spoiler and ailerons that increase/decrease the surface area (longitudinal axis) of the wings to allow the aircraft to ascend/descend and roll. The entire wing is divided into three basic sections: the wing leading edge (forward), the fuel tanks (middle), and the flap wells (aft/trailing edge). Each wing has a flap well that is divided into 6 sections. Each section contains hydraulic lines, torque tubes/jack-screws, spoiler actuators, aileron and spoiler flight control cables, electrical actuator wires, and nitrogen lines from the two dewars. A dewar is a barrel-like container storing 750 lbs of liquid nitrogen that is distributed to the integral fuel tanks and FSS by passing nitrogen gas through heat exchangers.

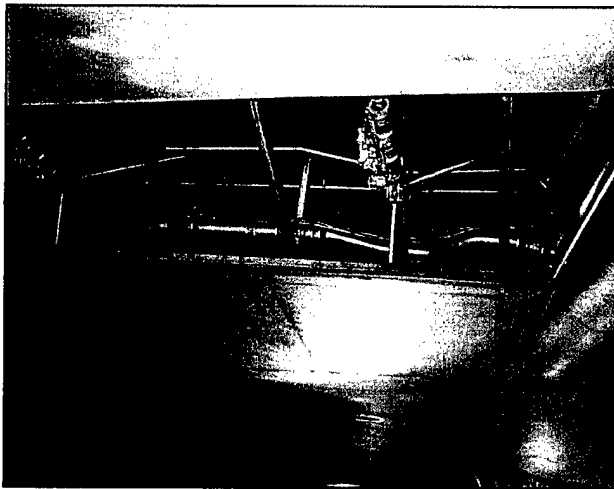


Figure 24. Flap Well: Underneath wing.

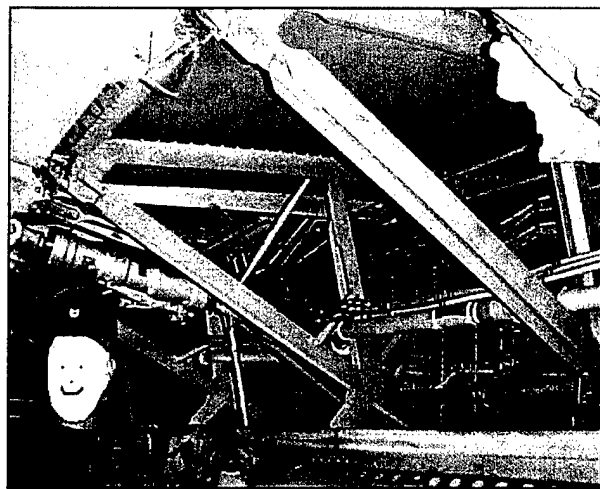


Figure 25. Flap Well: Interior.

INNER DIMENSIONS

#1. Length (left to right) = 14.5'	Width (forward to aft) = 2.5'	Depth (top to bottom) = 5.0'
#2. Length (left to right) = 12.0'	Width (forward to aft) = 4.0'	Depth (top to bottom) = 36.0"
#3. Length (left to right) = 11.0'	Width (forward to aft) = 2.0'	Depth (top to bottom) = 36.0"
#4. Length (left to right) = 10.5'	Width (forward to aft) = 2.0'	Depth (top to bottom) = 36.0"
#5. Length (left to right) = 9.0'	Width (forward to aft) = 1.5'	Depth (top to bottom) = 29.0"
#6. Length (left to right) = 9.0'	Width (forward to aft) = 1.5'	Depth (top to bottom) = 20.0"

[The depth is the distance from the entrance to the most distant point.]

ENTRY DIMENSIONS

#1. Length = 14.5'	Width = 36.0"
#2. Length = 12.0'	Width = 36.0"
#3. Length = 11.0'	Width = 33.0"
#4. Length = 10.5'	Width = 24.0"
#5. Length = 9.0'	Width = 20.0"
#6. Length = 9.0'	Width = 19.0"

(all six flap well entrances are rectangular)

SPACE ACCESS/INNER AREA

Each of the six flap well sections has a single bottom entrance. The inner shape of each flap well is triangular.

RECOMMENDED CLASSIFICATION

Not a confined space.

JUSTIFICATION FOR CLASSIFICATION

The flap wells are not large enough to bodily enter, and do not have a limited means of entry or egress. Therefore, it is not a confined space and not regulated IAW the AFOSH and OSHA confined space standards.

TASKS PERFORMED WITHIN THE SPACE

Personnel from several work centers can enter the flap well to perform both general and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following tasks may be performed during scheduled and routine maintenance:

- General inspections are conducted on each aircraft during ISO Inspections (every 420 days). Each inspection takes approximately 15 hours. Visual inspections for damage or leaks are conducted on the jack-screws, cables, valve cranks, pulleys, and hardware (e.g., mounts, fittings, clamps, screws, bolts). In addition the bearings are checked for wear and slippage. No chemicals are used. This task is performed under TO 1C-5A-6WC-5, WCs 2-130, 2-131, 2-132, 2-148, 2-149, and 2-150, *Preflight Inspection – Isochronal*.
- The Hydraulic shop replaces the hydraulic ground spoiler actuator filters during ISO Inspections (every 420 days). Eight filters are replaced on every aircraft during each 3 hour inspection. The old filter is removed by disconnecting the filter bowl and cutting the safety wire. An o-ring is placed on the new filter before the filter bowl and safety wires are replaced. No chemicals are used. This task is performed under TO 1C-5A-2-9, *Flight Controls*.

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the flap well.

C-5 GALAXY

FLAP PACK COMPARTMENT –

Not Shown
(Located Inside Aircraft
Fuselage)

SPACE DESCRIPTION

The flap pack compartment is also known as the forward torque deck. It is located above the aft cargo area, in the troop compartment adjacent to the latrines. The flap pack compartment contains the manifold hydraulic system, electrical power transfer unit (PTU), electrical autopilot servo wires, and hydraulic pumps [3,000 psi]. The space also contains the torque tubes which drive the wing gear boxes that control the wing flaps.

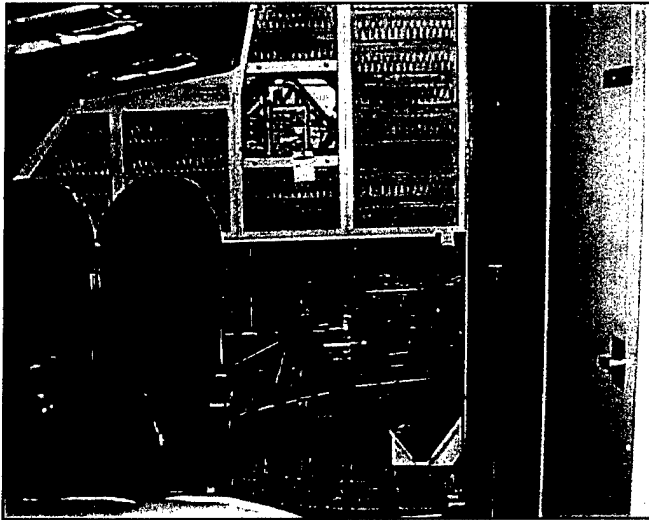


Figure 26. Flap pack compartment: Access in troop compartment, next to latrines.

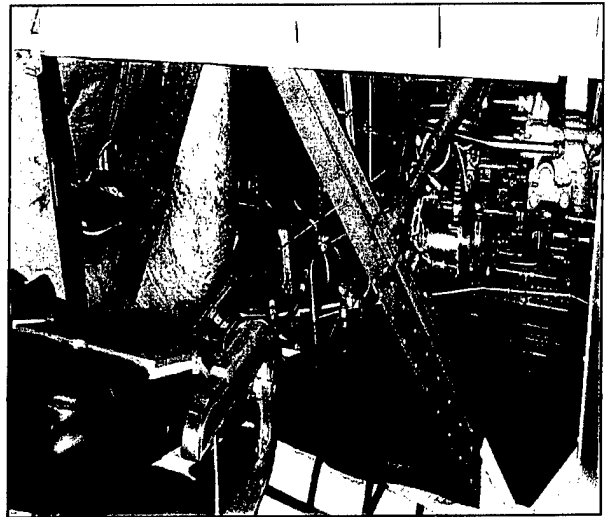


Figure 27. Flap pack compartment: Interior.

INNER DIMENSIONS

Length = 13.0'
Width = 6.0'
Depth = 3.0'

ENTRY DIMENSIONS

A-Model: Length = 1.0' Width = 1.0'
B-Model: Length = 6.5' Width = 3.5'

[The depth is the distance from the entrance to the most distant point.]

SPACE ACCESS/INNER AREA

The flap pack compartment of each C-5 model (C-5A & C-5B) has a single side access. Both models also have an opening in the floorboard where a person can fall through to the aft cargo area.

RECOMMENDED CLASSIFICATION

A-model: nonpermit-required confined space.

B-model: not a confined space.

JUSTIFICATION FOR CLASSIFICATION

The flap pack compartment of the C-5 A-model is a confined space because it has a small enough access that causes the space to have a limited means of entry and egress. However, the space is not permit-required because it has a variety of closed/contained systems (e.g., manifold hydraulic system, electrical PTU, electrical autopilot servo wires, hydraulic pumps [3,000 psi], torque tubes) that are not CREDIBLE potential hazards. The systems are hazardous if they are intentionally opened or a significant leak occurs. These conditions are unlikely due to personnel training and specific aircraft TOs and OIs that personnel are strictly required to comply with. The TOs and OIs govern procedures such as lockout/tagout and system checks prior to entering the various areas of aircraft.

The flap pack compartment of the C-5 B-model is not a confined space because the access size is large enough to not have a limited means of entry or egress. Therefore, it is not a confined space and not regulated IAW the AFOSH and OSHA confined space standards.

TASKS PERFORMED WITHIN THE SPACE

Personnel from several work centers can enter the flap pack compartment to perform both general and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following tasks may be performed during scheduled and routine maintenance:

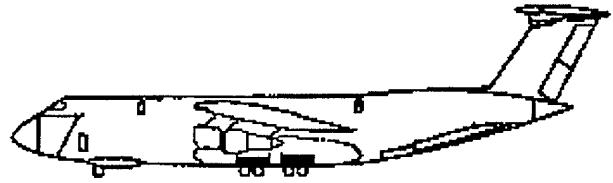
- General inspections are conducted on each aircraft during ISO Inspections (every 420 days). Each inspection takes approximately 60 minutes. Visual checks for damage or leaks are conducted on the structural flooring/braces, hydraulic lines/fittings/clamps, aileron flight controls cables/pulleys/guards, and hardware (e.g., mounts, fittings, clamps, screws, bolts). The torque tubes are checked for proper movement and defects. No chemicals are used. This task is performed under TO 1C-5A-6WC-5, WC 2-05.

- Approximately three hydraulic clamps are replaced during ISO Inspections (every 420 days). Each clamp takes 2 minutes to mechanically replace. No chemicals are used. This task is performed under TO 1C-5A-2-3, *Hydraulic*.

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the flap pack compartment.

C-5 GALAXY

AFT WHEEL WELL AREA – (LEFT/RIGHT)



SPACE DESCRIPTION

There is an aft wheel well area located on each side of the C-5 aircraft. The crosshead section is located above the wheel well area. Both components are collectively classified as a single wheel well space. The space contains the landing gear, the wheel and tire assembly, the hydraulic brake system, electrical lines, hydraulic/nitrogen struts with jack-screws, hydraulic rotation actuators, various landing gear sensors, and hydraulic gear box motors.

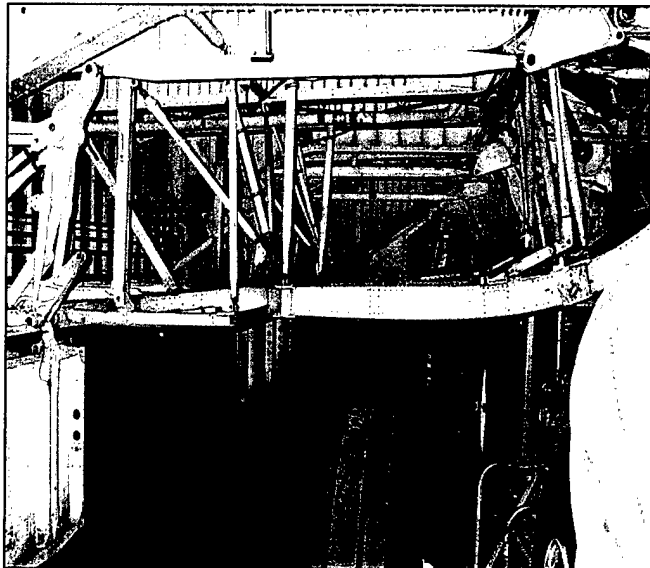


Figure 28. Aft Wheel Well: Left side interior (facing aft end). Figure 29. Aft Wheel Well: Left side exterior.

INNER DIMENSIONS

Forward Section:

Length = 31.5'
Width = 14.0'
Depth = 5.0'

Aft Section:

Length = 31.5'
Width = 14.0'
Depth = 5.0'

ENTRY DIMENSIONS

1. Length = 14.0' Width = 9.0'
2. Length = 9.0' Width = 2.5'
(both entrances are rectangular)

1. Length = 14.0' Width = 9.0'
2. Length = 9.0' Width = 2.5'
(both entrances are rectangular)

[The depth is the distance from the entrance to the most distant point.]

SPACE ACCESS/INNER AREA

The aft wheel well area is divided into two identical sections (forward and aft), and each section contains two sets of landing gear assemblies. Each landing gear assembly has four wheels (two pairs); therefore, each aft wheel well area has eight wheels (four pairs).

The smaller access (9.0' x 2.5') is located on the bottom of the space. The larger access (14.0' x 9.0') is oriented diagonally on the side and bottom of the space.

RECOMMENDED CLASSIFICATION

Not a confined space.

JUSTIFICATION FOR CLASSIFICATION

The aft wheel well area does not have a limited means of entry and egress due to the size of the entrances. Therefore, it is not a confined space and not regulated IAW the AFOSH and OSHA confined space standards. However, if a worker can enter the space with both access panels shut, then the wheel well area would be classified at a permit-required confined space. In order to shut both panels, the landing gear must be retracted into the wheel well chamber (crosshead area). This is an unlikely situation, and is not part of routine scheduled maintenance. However, the AERO Repair shop personnel may enter the space (waist up) to perform measurements while the landing gear is closing. It is unclear if the access panels are open during this process; and therefore determining if this procedure is a permit-required confined space entry is not possible until the it is further evaluated.

TASKS PERFORMED WITHIN THE SPACE

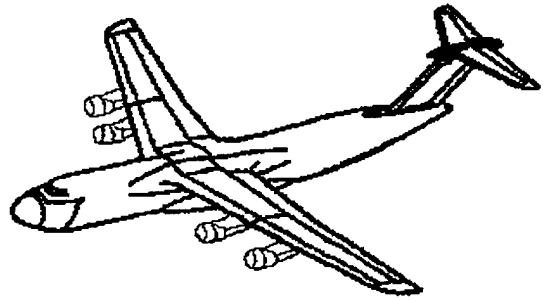
Personnel from several work centers can enter the aft wheel well area to perform both general and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following tasks may be performed during scheduled and routine maintenance:

- Scheduled maintenance inspections are conducted on each wheel and tire assembly during ISO Inspections (420 days), or as needed depending on the number of landings. The bearings are greased/lubed, and nitrogen is added to the tires. Both tasks take a few minutes. Approximately once a month, both sets of rear tires (six tires) and the two nose area tires are replaced. The only chemicals used during each inspection are nitrogen gas and approximately one pint of grease/lubricant. This task is performed under TOs *1C-5A-6WC-5* and *1C-5A-2-102, MADARS*.
- Routine brake inspections and maintenance are performed every 120 days. During the inspection, the brakes are removed, reconditioned, replaced, and then the system undergoes an operational check. Reconditioning the brakes takes place in the Brake shop. The removal, replacement, and system check takes approximately two hours, and is conducted in the space. The only chemicals used during each inspection are hydraulic fluid and approximately one pint of grease/lubricant. The brake inspections are performed under TO *1C-5A-2-10, Landing Gear*.
- The landing gear is replaced once every three years, and the entire process take a total of 24 hours. After the landing gear is reinstalled, two 14-ounce cartridges of graphite-type lubricant are used to relube the various components. This task is performed under TO *1C-5A-2-10, Landing Gear*.
- Gear assembly lubing is conducted every 120 days. Approximately eight 14-ounce cartridges of graphite-type lubricant is used to lube 116 fitting points in each of the two aft wheel well areas, and 70 to 80 fitting points in the front wheel well. Lubing every point takes approximately four hours. Eight cartons of graphite lubricant are used every 120 days during this task. The lubing is performed under TO *1C-5A-6WC-13, Environmental Control*.
- Replacing and repacking a hydraulic/nitrogen pressurized strut occurs during ISO Inspections (every 420 days) or if a leak is detected. The entire process takes approximately 16 hours per strut. The only chemical used is 1 ounce of grease. This task is performed under TO *1C-5A-2-10*.

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the wheel well area.

C-5 Galaxy

HORIZONTAL STABILIZER



SPACE DESCRIPTION

The horizontal stabilizer controls the pitch (up/down) motion of the aircraft. The space is located in the horizontal tail wing, and is divided into a forward and an aft section. The forward section of the horizontal stabilizer contains the electrically operated hydraulic pitch trim actuator (PTA), the autopilot system, and line replacement units (LRUs). The aft section contains the navigation light [28 volts], battery operated emergency locator transmitter (ELT) sensor components, and rear anti-collision strobe light power supply [300 volts].

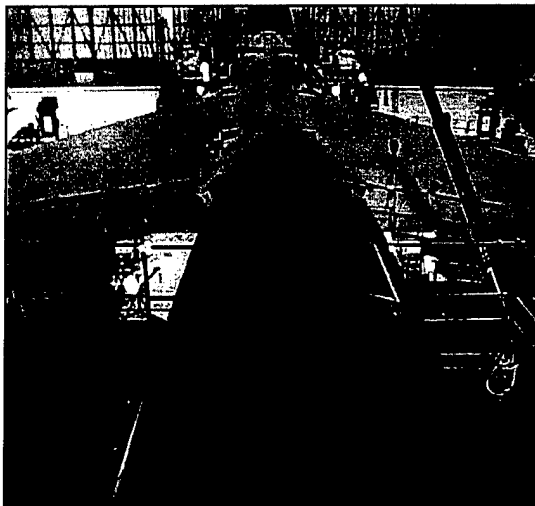


Figure 30. Horizontal Stabilizer: Forward section.



Figure 31. Horizontal Stabilizer: Aft section.

INNER DIMENSIONS

1. Forward Section:	Length = 17.0'	Width = 41.0"	Depth = 8.0'
2. Aft Section:	Length = 18.0'	Width = 44.0"	Depth = 3.5'

ENTRY DIMENSIONS

1. Forward Section (top):	Length = 30.0"	Width = 17.0"
2. Aft Section (top):	Length = 26.0"	Width = 23.0"
3. Aft Section (bottom):	Length = 34.0"	Width = 28.0"

(all entrances are rectangular)

[The depth is the distance from the entrance to the most distant point.]

SPACE ACCESS/INNER AREA

The bottom access in the aft section of the horizontal stabilizer leads into the vertical stabilizer. The two top entrances are located on the top panels of the tail wing.

RECOMMENDED CLASSIFICATION

Nonpermit-required confined space.

JUSTIFICATION FOR CLASSIFICATION

The space contains a variety of closed/contained systems (e.g., PTA, autopilot system, LRUs, navigation light, ELT sensor components, and rear anti-collision strobe light power supply) that are not CREDIBLE potential hazards, and therefore is not a permit-required confined space. The systems are hazardous if they are intentionally opened or a significant leak occurs. These conditions are unlikely due to personnel training and specific aircraft TOs and OIs that personnel are strictly required to comply with. The TOs and OIs govern procedures such as lockout/tagout and system checks prior to entering the various areas of the aircraft.

TASKS PERFORMED WITHIN THE SPACE

Personnel from several work centers can enter the horizontal stabilizer to perform both scheduled and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following tasks may be performed during scheduled and routine maintenance:

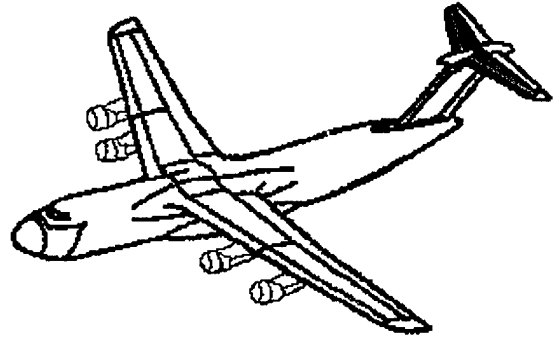
- General inspections in the forward horizontal stabilizer section are conducted during ISO Inspection (every 420 days). A visual check is performed on the PTA components, mounting brackets, drain holes, and various hardware. No chemicals are used. The process takes 15 to 30 minutes. This task is performed under TO 1C-5A-6WC-5, WCs 2-077 and 2-092.
- The LRU and autopilot system of the forward horizontal stabilizer section is inspected/replaced every 2 to 3 years. After the system is visually inspected, the removal process involves disconnecting the surrounding hardware, installing the new LRU components, and then replacing the hardware. No chemical are used. The inspection and LRU installation takes 30 to 60 minutes. This task is performed under TO 1C-5A-6WC-9, *Flight Controls*.

- The anti-skid material in the horizontal stabilizer is replaced during ISO Inspections (420 days). The process takes 60 minutes. Isopropyl alcohol and a putty knife is used to remove the worn anti-skid tape. This task is performed under TO 1C-5A-2-2, *Airframe*.
- Hardware inspections are performed in the aft horizontal stabilizer section during ISO Inspections (420 days). It takes 30 minutes to visually inspect the clamps and other hardware. No chemicals are used. This task is performed under TO 1C-5A-1-1A-8, *Hardware*.

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the horizontal stabilizer.

C-5 Galaxy

HORIZONTAL STABILIZER BOX ACCESS – (LEFT/RIGHT)



SPACE DESCRIPTION

The horizontal stabilizer box access is located in the tail wing section of the aircraft, on the left and right side of the horizontal stabilizer. The horizontal stabilizer box access contains only structural support such as cross braces, ribs, and brackets.

INNER DIMENSIONS

Length (inboard to outboard) = 6.0'
Width (forward to aft) = 9.0'
Depth (top to bottom) = 16.0" to 10.0"

ENTRY DIMENSIONS

Length = 21.0"
Width = 14.0"
(rectangular entrance)

[The depth is the distance from the entrance to the most distant point.]

SPACE ACCESS/INNER AREA

The horizontal stabilizer box access can only be accessed from a single top access.

RECOMMENDED CLASSIFICATION

Nonpermit-required confined space.

JUSTIFICATION FOR CLASSIFICATION

The space does not contain potential atmospheric or serious health hazards.

TASKS PERFORMED WITHIN THE SPACE

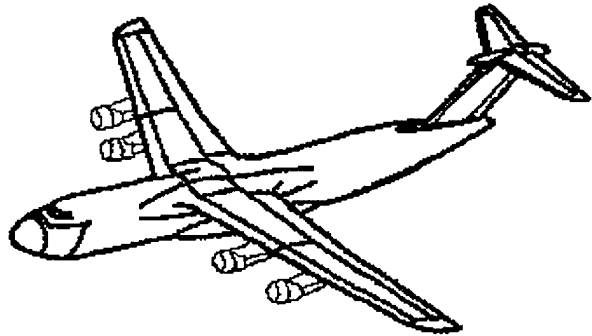
These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following task may be performed during scheduled and routine maintenance:

- General inspections are conducted every 2 to 5 years. First, the access panel is removed before a visual inspection is performed on the structural components. B $\frac{1}{2}$ sealant is used to replace the access panel. This task is performed under TO 1C-5A-3.

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the space.

C-5 GALAXY

VERTICAL STABILIZER (T-TAIL)



SPACE DESCRIPTION

The vertical stabilizer controls the rudder (left/right) motion of the aircraft. The space is located in the vertical tail section of the C-5, and can be accessed from the top of the hayloft by maintenance personnel. The vertical stabilizer contains flight control components such as elevator/rudder cables, elevator/rudder hydraulic lines, digital flight data recorder, line replacement units (LRUs), and battery operated underwater locator (UWL) beacon.

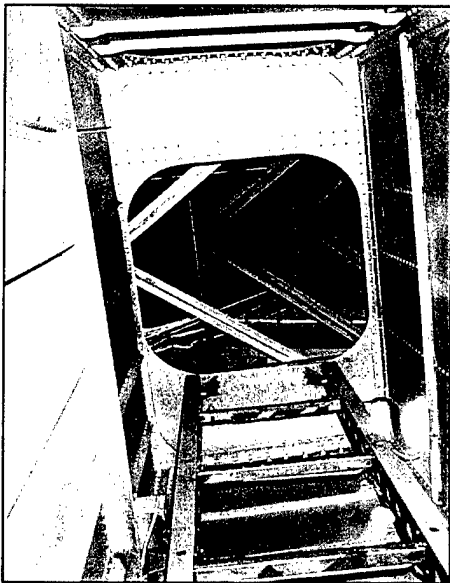


Figure 32. Vertical Stabilizer: Bottom entrance from hayloft.

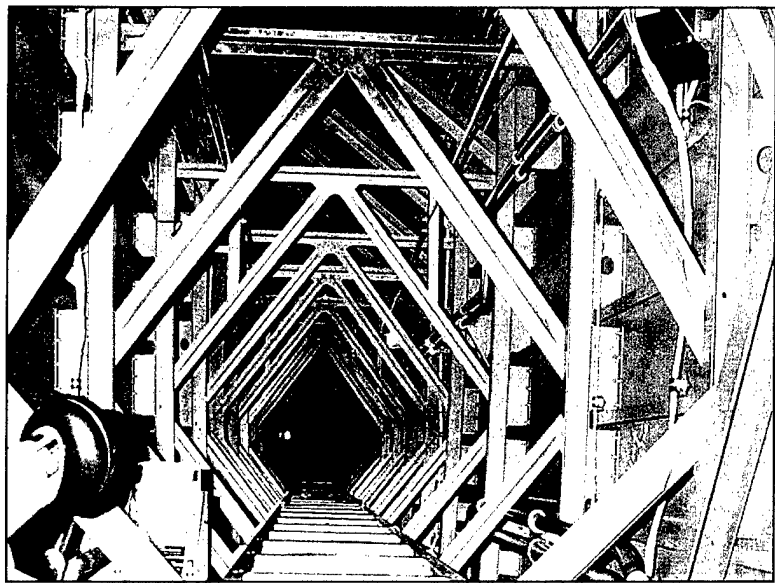


Figure 33. Vertical Stabilizer: Interior.

INNER DIMENSIONS

Length (forward to aft) = 13.0'
Width (left to right) = 4.0'
Depth (top to bottom) = 35.0'

ENTRY DIMENSIONS

Length = 24.0"
Width = 22.0"
(both entrances are square)

[The depth is the distance from the entrance to the most distant point.]

SPACE ACCESS/INNER AREA

The vertical stabilizer is similar to a crawlspace that is elevated to about a 75-degree angle with an access at each end. The bottom entrance is accessed through the top of the hayloft. The top entrance is connected to the bottom of the horizontal stabilizer.

RECOMMENDED CLASSIFICATION

Nonpermit-required confined space.

JUSTIFICATION FOR CLASSIFICATION

The space contains a variety of closed/contained systems (e.g., flight control components such as elevator and rudder cables/hydraulic lines, LRUs, digital flight data recorder, UWL beacon) that are not CREDIBLE potential hazards, and therefore is not a permit-required confined space. The systems are hazardous if they are intentionally opened or a significant leak occurs. These conditions are unlikely due to personnel training and specific aircraft TOs and OIs that personnel are strictly required to comply with. The TOs and OIs govern procedures such as lockout /tagout and system checks prior to entering the various areas of the aircraft.

TASKS PERFORMED WITHIN THE SPACE

Personnel from several work centers can enter the vertical stabilizer to perform both scheduled and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following tasks may be performed during scheduled and routine maintenance:

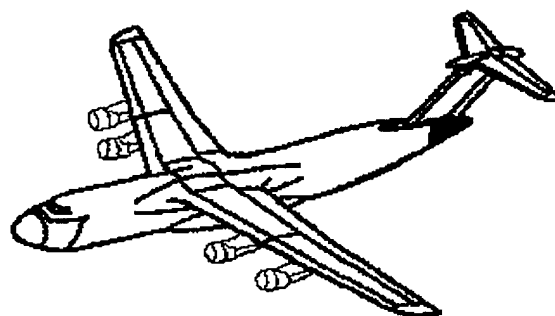
- General inspections are conducted during ISO Inspections (420 days). A visual inspection is conducted on all of the components. No chemical are used. This task takes 20 to 50 minutes, and is performed under TO 1C-5A-6WC-5, WCs 2-071, 2-077, 2-081, *Preflight Inspection – Isochronal*.
- Sheet metal inspections are conducted during ISO Inspections (420 days). A visual inspection is conducted on hinges, bolts, supports, struts, and attach points. A corrosion preventive compound (CPC) is applied to pivot points. This task takes 20 to 50 minutes, and is performed under TO 1C-5A-23, *System Peculiar Corrosion Control*.

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the vertical stabilizer.

C-5 GALAXY

HAYLOFT AREA

SPACE DESCRIPTION



The hayloft area is located below the vertical stabilizer at the rear end of the troop compartment (upper aft cargo area). The space contains flight control components such as elevator/rudder cables, elevator/rudder hydraulic lines, anti-hijack screens at the aft end, line replacement unit (LRU) components, and HF radio couplers.

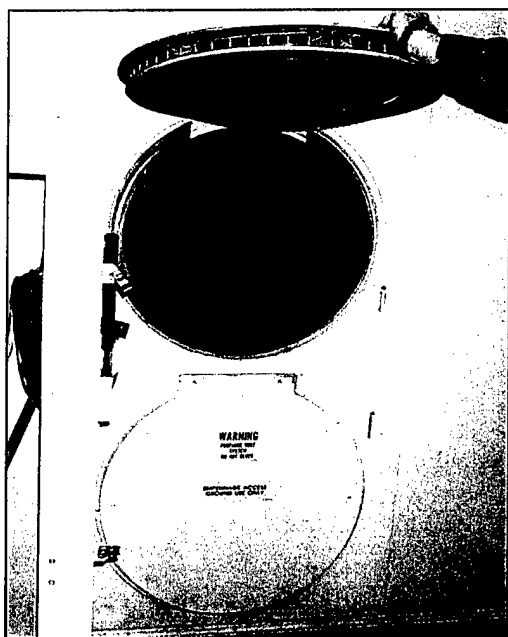


Figure 34. Hayloft Area: Two side entrances in aft cargo area.

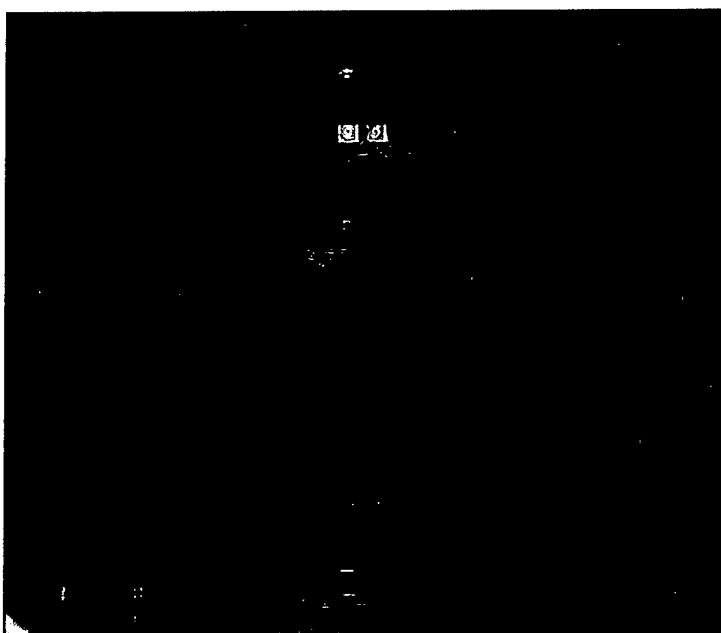


Figure 35. Hayloft Area: Interior facing aft end (anti-hijack screen).

INNER DIMENSIONS

Length (forward to aft) = 13.0'
Width (left to right) = 4.0'
Depth (forward to aft) = 65.0'

ENTRY DIMENSIONS

1. Side: Diameter = 2.0'
2. Side: Diameter = 2.0'
3. Top: Length = 39.0" Width = 35.0"

[The depth is the distance from the entrance to the most distant point.]

SPACE ACCESS/INNER AREA

The hayloft area is shaped like a sideways "U" with the aft end of the space as the curved portion. The two side entrances are negative pressure doors located at the forward wall of the space in the troop compartment. The top entrance is rectangular and located in the middle of the space, and leads to the vertical stabilizer.

RECOMMENDED CLASSIFICATION

Nonpermit-required confined space.

JUSTIFICATION FOR CLASSIFICATION

The space contains a variety of closed/contained systems (e.g., flight control components such as elevator and rudder cables/hydraulic lines, LRUs, HF radio couplers) that are not CREDIBLE potential hazards, and therefore is not a permit-required confined space. The systems are hazardous if they are intentionally opened or a significant leak occurs. These conditions are unlikely due to personnel training and specific aircraft TOs and OIs that are strictly complied with. The TOs and OIs govern procedures such as lockout /tagout and system checks prior to entering the various areas of the aircraft.

TASKS PERFORMED WITHIN THE SPACE

Personnel from several work centers can enter the hayloft area to perform both scheduled and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following tasks may be performed during scheduled and routine maintenance:

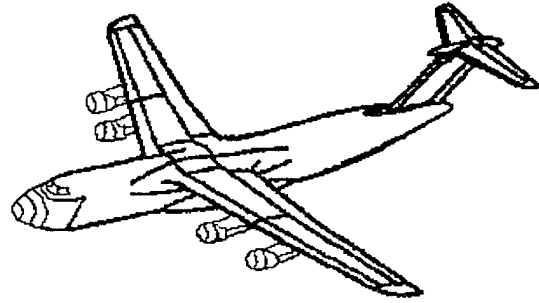
- General inspections are conducted during ISO Inspections (420 days). A visual inspection is conducted on the hydraulic lines, flight control cables, electrical wires, structural components, and hardware (e.g., clamps, rivets, stairs). No chemical are used. This task takes 60 minutes, and is performed under TO 1C-5A-6WC-5.

- Sheet metal inspections are conducted during ISO Inspections (420 days). A visual inspection is conducted on the deck floor, fasteners, and the honeycomb flooring panels. No chemicals are used. This task takes 20 to 50 minutes, and is performed under TO 1C-5A-6WC-5.
- The HF radio coupler is replaced during each ISO Inspection (420 days). The process takes 60 minutes, and no chemicals are used.
- A light bulb is replaced during each ISO Inspection (420 days). The cover of the dead bulb is removed, the new bulb is installed, and then the cover is replaced. The procedure takes 10 minutes per bulb. No chemicals are used. This task is performed under TO 1C-5A-6WC-5.

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the hayloft area.

C-5 GALAXY

NOSE VISOR AREA



SPACE DESCRIPTION

The nose visor area is located aft of the radome plug. It can be raised along with the nose of the aircraft (radome and radome plug). The nose visor area contains hydraulic lines, fuel shut-off cables, flight control cables, throttle cables/components, autopilot line replacement units (LRUs), and the receiver transmitter for the color weather radar.

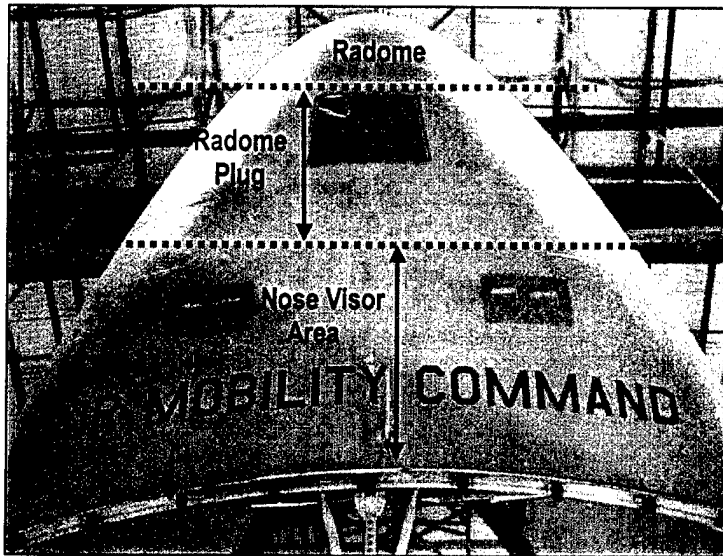


Figure 36. Nose Visor Area: Exterior with radome & radome plug.

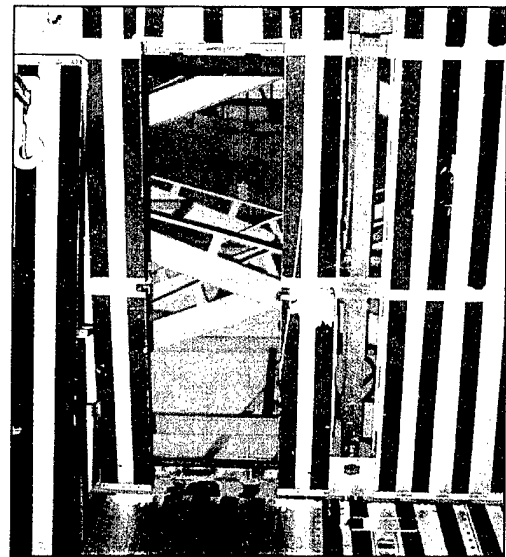


Figure 37. Nose Visor Area: Side access with visor area raised.

INNER DIMENSIONS

Length (forward to aft) = 13.5'
Depth (left to right) = 22.0'

ENTRY DIMENSIONS

Length = 4.0'
Width = 2.0'
(rectangular entrance)

[The depth is the distance from the entrance to the most distant point.]

SPACE ACCESS/INNER AREA

The nose visor area is cylinder shaped, with the forward side shorter than the aft side. The side entrance is located in the forward cargo area.

RECOMMENDED CLASSIFICATION

Not a confined space.

JUSTIFICATION FOR CLASSIFICATION

The nose visor area is not a confined space because the access size is large enough for the space to not have a limited means of entry or egress. Therefore, it is not a confined space and not regulated IAW the AFOSH and OSHA confined space standards.

TASKS PERFORMED WITHIN THE SPACE

Personnel from several work centers can enter the Visor area to perform both general and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following tasks may be performed during scheduled and routine maintenance:

- The color weather radar is inspected and repaired during ISO Inspections (every 420 days) for each aircraft. Each inspection takes approximately 35 minutes. The crystals are checked for moisture, and replaced as needed. No chemicals are used. This task is performed under TO 1C-5A-2-8.
- General system inspections are conducted during ISO Inspections (every 420 days) for each aircraft. Each inspection takes approximately 5 hours. Visual checks for damage or leaks are conducted on the hydraulic lines, fuel shut-off cables, flight control cables, throttle cables, structural supports, seals, and hardware (e.g., clamps, screws, bolts). No chemicals are used in the space. This task is performed under TO 1C-5A-6WC-5.
- The three forward loading lights are inspected and replaced during ISO Inspections (every 420 days). The process takes 10 minutes to identify the damaged bulb, remove the light cover, and replace the damaged bulb. No chemicals are used in the space. This task is performed under TO 1C-5A-6WC-5.

- The hydraulic shop replaces an autopilot LRU during each ISO Inspection (every 420 days) for each aircraft. The LRU hydraulic lines are checked for leaks, binding, and exterior damage. Damaged hydraulic lines are replaced as needed. No chemical are brought into the space. This task is performed under TO 1C-5A-6WC-9, *Flight Controls*.

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the visor area.

C-5 GALAXY

RADOME PLUG

SPACE DESCRIPTION

The radome plug is located between the radome and nose visor area. The space contains the weather radar antenna (wave guide) and electrical wires from the radar dish in the radome [28 DC volts].

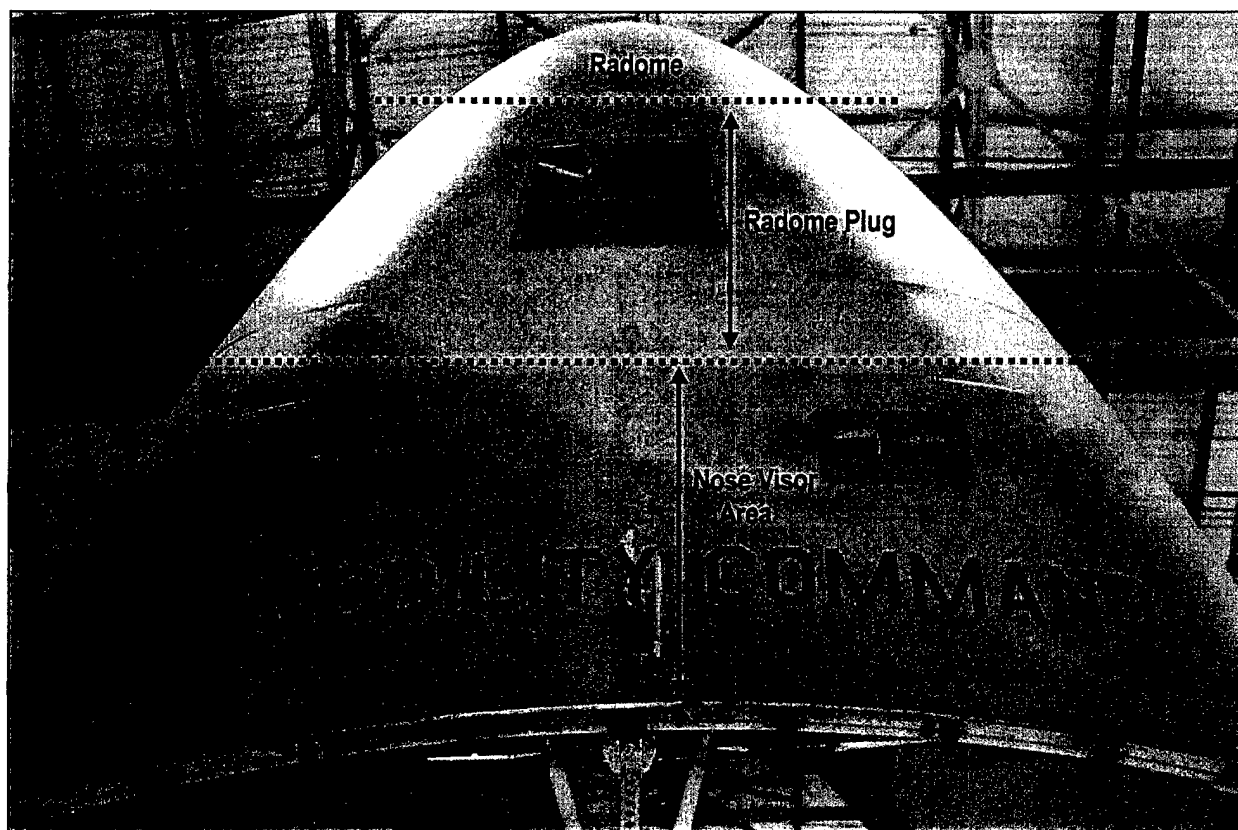
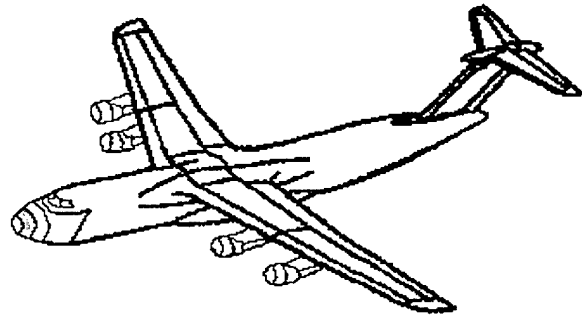


Figure 38. Radome plug: Exterior view. Shows the radome on top of the radome plug, and the nose visor area below it.

INNER DIMENSIONS

Diameter (forward side) = 6.0'
Diameter (aft side) = 10.0'
Length (forward to aft) = 8.0'

ENTRY DIMENSIONS

Length = 3.5'
Width = 2.0'
(rectangular entrance)

SPACE ACCESS/INNER AREA

The radome plug is cylinder shaped, with the forward side shorter than the aft side. The entrance is oriented on the bottom of the space when the nose is in the lowered position. When the nose is raised, the entrance is on the side.

RECOMMENDED CLASSIFICATION

Nonpermit-required confined space.

JUSTIFICATION FOR CLASSIFICATION

The space contains closed/contained systems (e.g., weather radar antenna, radar dish wires) that are not CREDIBLE potential hazards, and therefore is not a permit-required confined space. The systems are hazardous if they are intentionally opened or a significant leak occurs. These conditions are unlikely due to personnel training and specific aircraft TOs and OIs that are strictly complied with. The TOs and OIs govern procedures such as lockout /tagout and system checks prior to entering the various areas of the aircraft.

TASKS PERFORMED WITHIN THE SPACE

Personnel from several work centers can enter the radome plug to perform both scheduled and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following tasks may be performed during scheduled and routine maintenance:

- General inspections are conducted during ISO Inspections (420 days). A visual inspection is conducted on the electrical wires and hardware (e.g., clamps, rivets). No chemical are brought into the space. Before entry, a danger tag is placed on the arm switch located in the cargo compartment (forward load-master control panel) to prevent the visor from moving. This task takes 40 minutes, and is performed under TO 1C-5A-6WC-5, WC 2-087.

- The weather radar antenna wires are repaired every 2 to 3 years on each aircraft. The process takes 60 minutes. Mechanical tools (e.g., wires crimpers) are used to splice the damaged wires. The wires have self-contained solder/gel. Prior to entry, danger tags are placed on the appropriate circuit breakers located in the flight-deck; and a danger tag is placed on the arm switch located in the cargo compartment (forward load-master control panel) to prevent the visor from moving. This task is performed under TO 1C-5A-2-11, *Electrical Wiring*.
- Structural repairs are performed every 1 to 3 years on each aircraft. The process takes 16 hours. Drills and fastener are used to repair cracked rib and other structural components. B½ sealant may be used during the repairs. Prior to entry, danger tags are placed on the appropriate circuit breakers located in the flight-deck; and a danger tag is placed on the arm switch located in the cargo compartment (forward load-master control panel) to prevent the visor from moving. This task is performed under TO 1C-5A-3, *Structural*.

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the radome plug.